MARINE REVIEW

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SHIP BUILDING INDUSTRY IN AMERICA.

A more prosperous condition of the ship building industry than has ever existed in this country is shown in reports to the Marine Review published in this issue. The increased operations in ship yards throughout the United States are, however, confined almost entirely to ships for the coasting service, and not for the foreign trade that is now so much desired in America.

NAVAL VESSELS—A total of forty-nine vessels of war are building for the United States navy. The contract price of these vessels exclusive of armor and armament, is $34,554,410; total displacement, 117,263 tons; total horse power, 308,000. In addition to vessels for the United States navy, the Cramps of Philadelphia are building for the Russian navy a cruiser of 6,500 tons displacement and 20,000 horse power and a battleship of 12,700 tons displacement and 16,000 horse power. With these two vessels added, the total cost of vessels of war under construction is $39,554,410, exclusive of armor and armament; total displacement, 136,463; total horse power, 344,000. The list of vessels building for the United States navy includes six battleships, four monitors, seven cruisers, thirty-one torpedo craft and a submarine torpedo boat. It may be noted also that congress has authorized the construction of six other vessels—three battleships and three armored cruisers—for which contracts are delayed on account of legislative difficulties relative to prices of armor. The secretary of the navy has also recommended to the present congress the construction of eighteen more vessels of war.

ON COASTS AND WESTERN RIVERS—The best evidence of the general activity that exists in the ship yards of both coasts, as well as on the Western rivers, is the list of some 300 new vessels of which particulars are given on the following pages. It has been found impractical to present a full summary of values, horse power, etc., regarding new vessels on the coasts, on account of insufficiency of data, but the main purpose of this edition, to give all possible particulars of the vessels, is served by the tables.

ON THE GREAT LAKES—Complete returns regarding all vessels above 100 tons building on the great lakes show a total of thirty-seven, valued at $8,902,000. Their combined capacity on 18 feet draught is 185,500 gross tons, and the total horse power of the steamers in the list is 45,950. Twenty-three of these vessels are under construction at the several works of the American Ship Building Co.; most of them freight steamers of the very largest kind—6,000 to 8,000 gross tons capacity—building for big industrial interests controlled by the Carnegie Steel Co., Ltd., John D. Rockefeller and the American Steel & Wire Co.

VESSELS UNDER CONSTRUCTION FOR THE UNITED STATES NAVY.

Name of Vessel.	Where and by whom building.	Probable date of completion.	Dimensions. Length L. W. L.	Beam	Mean draught.	Displacement tons.	Indicated horse power.	Contract speed, knots.	Type of Engines.	Type of boilers.	Contract Price exclusive of armor and armament.
Battleships.											
Illinois	Newport News Works, Virginia.	Oct., 1900.	368	72.2	23.6	11,565	10,000	16	Twin-screw, vertical, triple expansion.	8 Sing. end. cylind.	$2,595,000
Alabama	Cramp & Sons, Philadelphia.	Feb., 1900.	368	72.2	23.6	11,565	10,000	16	Twin-screw, vertical, triple expansion.	8 Sing. end. cylind.	2,650,000
Wisconsin	Union Iron Works, San Francisco.	May, 1900.	368	72.2	23.6	11,565	10,000	16	Twin-screw, vertical, triple expansion.	8 Sing. end. cylind.	2,674,950
Maine	Cramp & Sons, Philadelphia.	June, 1901.	388	72.2	23.6	12,300	16,000	18	Twin-screw, vertical, triple expansion.	24 Niclausse.	2,885,000
Missouri	Newport News Works, Virginia.	Feb., 1902.	388	72.2	23.6	12,230	16,000	18	Twin-screw, vertical, triple expansion.	12 Thornycroft.	2,885,000
Ohio	Union Iron Works, San Francisco.	Mar., 1902.	388	72.2	23.6	12,440	16,000	18	Twin-screw, vertical, triple expansion.	12 Thornycroft.	2,899,000
Monitors.											
Arkansas	Newport News Works, Virginia.	Sep., 1901.	252	50	12.6	3,235	2,400	11.5	Twin-screw, vertical, triple expansion.	4 Thornycroft.	960,000
Connecticut	Bath Iron Works, Bath, Me.	Mar., 1901.	252	50	12.6	3,235	2,400	11.5	Twin-screw, vertical, triple expansion.	4 Niclausse.	962,000
Florida	Lewis Nixon, Elizabeth, N. J.	Apr., 1901.	252	50	12.6	3,235	2,400	11.5	Twin-screw, vertical, triple expansion.	4 Mosher.	925,000
Wyoming	Union Iron Works, San Francisco.	Mar., 1901.	252	50	12.6	3,235	2,400	11.5	Twin-screw, vertical, triple expansion.	4 Babcock&Wilcox	975,000
Cruisers.											
*Albany	Armstrong's, Newcastle, England.	Feb., 1900.	346	44	18.0	3,769	7,500	20	Twin-screw, vertical, triple expansion.	4 dbl. end. cylind.	794,894
Denver	Neafie & Levy, Philadelphia.	July, 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion.	6 water tube.	1,080,000
Galveston	Wm. R. Trigg Co., Richmond.	Jan., 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion.	6 water tube.	1,027,000
Chattanooga	Lewis Nixon, Elizabeth, N. J.	July, 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion.	6 water tube.	1,039,966
Cleveland	Bath Iron Works, Bath, Me.	July, 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion.	6 water tube.	1,041,650
Tacoma	Union Iron Works, San Francisco.	Apr., 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion.	6 water tube.	1,041,900
Desmoines	Fore River Co., Weymouth, Mass.	July, 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion.	6 water tube.	1,065,000
Torpedo Craft.											
Bainbridge	Neafie & Levy, Philadelphia.	Dec., 1900.	245	23.7	6.6	420	8,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft.	283,000
Barry	Neafie & Levy, Philadelphia.	Dec., 1900.	245	23.7	6.6	420	8,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft.	283,000
Chauncey	Neafie & Levy, Philadelphia.	Dec., 1900.	245	23.7	6.6	420	8,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft.	283,000
Dale	Wm. R. Trigg Co., Richmond.	Nov., 1900.	245	23.7	6.6	420	8,000	28	Twin-screw, vertical, triple expansion.	4 Thornycroft.	260,000
Decatur	Wm. R. Trigg Co., Richmond.	Nov., 1900.	245	23.7	6.6	420	8,000	28	Twin-screw, vertical, triple expansion.	4 Thornycroft.	260,000
Hopkins	Harlan & Hollingsworth, Wilmington.	Jan., 1901.	244	24.6	6.0	408	7,200	29	Twin-screw, vertical, triple expansion.	4 Thornycroft.	291,000
Hull	Harlan & Hollingsworth, Wilmington.	Jan., 1901.	244	24.6	6.0	408	7,200	29	Twin-screw, vertical, triple expansion.	4 Thornycroft.	291,000
Lawrence	Fore River Co., Weymouth, Mass.	June, 1900.	242	22.3	6.2	400	8,400	30	Twin-screw, vertical, triple expansion.	4 water tube.	281,000
Macdonough	Fore River Co., Weymouth, Mass.	July, 1900.	242	22.3	6.2	400	8,400	30	Twin-screw, vertical, triple expansion.	4 water tube.	281,000
Paul Jones	Union Iron Works, San Francisco.	Aug., 1900.	245	23.7	6.6	420	7,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft.	285,000
Perry	Union Iron Works, San Francisco.	Aug., 1900.	245	23.7	6.6	420	7,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft.	285,000
Preble	Union Iron Works, San Francisco.	Aug., 1900.	245	23.7	6.6	420	7,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft.	285,000
Stewart	Gas Engine & Power Co., New York.	In doubt.	245	23.7	6.6	420	8,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft.	282,000
Truxton	Maryland Steel Co., Sparrows Point.	In doubt.	248	23.3	6.0	433	8,300	30	Twin-screw, vertical, triple expansion.	4 Normand.	286,000
Whipple	Maryland Steel Co., Sparrows Point.	In doubt.	248	23.3	6.0	433	8,300	30	Twin-screw, vertical, triple expansion.	4 Normand.	286,000
Worden	Maryland Steel Co., Sparrows Point.	In doubt.	248	23.3	6.0	433	8,300	30	Twin-screw, vertical, triple expansion.	4 Normand.	286,000
Bailey	Gas Engine & Power Co., New York.	July, 1900.	205	19.2	6.0	235	5,600	30	Twin-screw, vertical, triple expansion.	4 Seabury.	210,000
Goldsborough	Wolff & Zwicker, Portland, Ore.	Apr., 1900.	195	20.5	5.0	247	6,000	30	Twin-screw, vertical, triple expansion.	3 Thornycroft.	214,000
Stringham	Harlan & Hollingsworth, Wilmington.	Apr., 1900.	225	22.0	6.6	340	7,200	30	Twin-screw, vertical, triple expansion.	4 Thornycroft.	236,000
Bagley	Bath Iron Works, Bath, Me.	Nov., 1900.	157	17.0	4.7	167	4,200	28	Twin-screw, vertical, quadruple expansion.	2 Normand.	161,000
Barney	Bath Iron Works, Bath, Me.	Nov., 1900.	157	17.0	4.7	167	4,200	28	Twin-screw, vertical, quadruple expansion.	2 Normand.	161,000
Biddle	Bath Iron Works, Bath, Me.	Nov., 1900.	157	17.0	4.7	167	4,200	28	Twin-screw, vertical, quadruple expansion.	2 Normand.	161,000
Blakely	Geo. Lawley & Sons, S. Boston.	Apr., 1900.	175	17.6	4.8	165	3,000	26	Twin-screw, vertical, quadruple expansion.	3 Normand.	159,400
Delong	Geo. Lawley & Sons, S. Boston.	Apr., 1900.	175	17.6	4.8	165	3,000	26	Twin-screw, vertical, quadruple expansion.	3 Normand.	159,400
Nicholson	Lewis Nixon, Elizabeth, N. J.	July, 1900.	175	17.0	4.6	174	3,000	26	Twin-screw, vertical, quadruple expansion.	3 water tube.	165,000
O'Brien	Lewis Nixon, Elizabeth, N. J.	July, 1900.	175	17.0	4.6	174	3,000	26	Twin-screw, vertical, quadruple expansion.	3 water tube.	165,000
Shubrick	Wm. R. Trigg Co., Richmond.	Apr., 1900.	175	17.6	4.8	165	3,000	26	Twin-screw, vertical, quadruple expansion.	3 Thornycroft.	129,750
Stockton	Wm. R. Trigg Co., Richmond.	Apr., 1900.	175	17.6	4.8	165	3,000	26	Twin-screw, vertical, quadruple expansion.	3 Thornycroft.	129,750
Thornton	Wm. R. Trigg Co., Richmond.	Apr., 1900.	175	17.6	4.8	165	3,000	26	Twin-screw, vertical, quadruple expansion.	3 Thornycroft.	129,750
Tingey	Columbian Iron Works, Baltimore.	Aug., 1900.	175	17.6	4.8	165	3,000	26	Twin-screw, vertical, quadruple expansion.	3 Thornycroft.	168,000
Wilkes	Gas Engine & Power Co., New York.	Oct., 1900.	175	17.6	4.8	165	3,000	26.5	Twin-screw, vertical, quadruple expansion.	3 Seabury.	146,000
Submarine Boat.											
Plunger	Columbian Iron Works, Baltimore.	In doubt.	85.3	11.6	.....	168	1,200	8	Twin-screw, vert., trip. exp.; also single screw operated by storage cells.	1 Mosher.	150,000
						117,263	308,000				$34,554,410

*Now undergoing trials.

Note.—In addition to above list, there is building at the works of the Cramps, Philadelphia, a battleship and cruiser for the Russian navy, the battleship of 12,700 tons displacement and 16,000 horse power, and the cruiser of 6,500 tons displacement and 20,000 horse power.

MERCHANT VESSELS BUILDING OR UNDER CONTRACT IN COAST SHIP YARDS.

Builders.	Nan e and Type of Vessel.	Dimensions. Over all.	Beam Molded.	Depth Molded.	Approximate Value.	Estimated Gross Tonnage.	Engines and Boilers.	Estimated Horse Power.	Building for
Cramp & Sons Co., Philadelphia	Stmr. Sierra					6000		7500	J. D. Spreckels & Co., San Francisco.
Cramp & Sons Co., Philadelphia	Stmr. Sanoma					6000		7500	J. D. Spreckels & Co., San Francisco.
Cramp & Sons Co., Philadelphia	Stmr. Ventura					6000		7500	J. D. Spreckels & Co., San Francisco.
Cramp & Sons Co., Philadelphia	Pass. and freight stmr					4500		4500	Cuba Mail S. S. Co., New York.
Cramp & Sons Co., Philadelphia	Pass. and freight stmr					4500		4500	Cuba Mail S. S. Co., New York.
Cramp & Sons Co., Philadelphia	Pass. and freight stmr					12000		10000	International Nav. Co., Philadelphia.
Cramp & Sons Co., Philadelphia	Pass. and freight stmr					12000		10000	International Nav. Co., Philadelphia.
Newport News Co., Newport News, Va.	Stmr. Comus	406	48	33.9	$600,000	5000	Vertical triple	4000	Cromwell S. S. Co., New York.
Newport News Co., Newport News, Va.	Stmr. Proteus	406	48	33.9	600,000	5000	Vertical triple	4000	Cromwell S. S. Co., New York.
Newport News Co., Newport News, Va.	Steamer	565	63	40	2,000,000	18600	Quadruple	16000	Pacific Mail S. S. Co.
Newport News Co., Newport News, Va.	Steamer	565	63	40	2,000,000	18600	Quadruple	16000	Pacific Mail S. S. Co.
Newport News Co., Newport News, Va.	Steamer	406	48	33.9	600,000	5000	Triple	4000	Southern Pacific Co.
Newport News Co., Newport News, Va.	Steamer	406	48	33.9	600,000	5000	Triple	4000	Southern Pacific Co.
Newport News Co., Newport News, Va.	Steamer	406	48	33.9	600,000	5000	Triple	4000	Southern Pacific Co.
Newport News Co., Newport News, Va.	Steamer	406	48	33.9	600,000	5000	Triple	4000	Southern Pacific Co.
Union Iron Works, San Francisco	Stmr. Californian	435	51	33½	600,000	6000	Tri. single screw; 4 Scotch	2500	American-Hawaiian S. S. Co., New York.
Union Iron Works, San Francisco	Ferryboat								Atchison, Topeka & Sante Fe R. R. Co.
Neafie & Levy, Philadelphia	Stmr. Augusta	260	46	17	275,000		Tri. 27, 40 and 69 by 42; 4 Scotch		Balti., Chesapeake & Richmond S. S. Co.
Neafie & Levy, Philadelphia	Tug Luckenbach	150	27	16	70,000		Tri. 16½, 24, 41 by 30; 1 Scotch		Lewis Luckenbach, New York.
Neafie & Levy, Philadelphia	Tug Ogontz	92	19	10	30,000		Comp. 15, 26 by 22; 1 Scotch		Philadelphia & Reading R. Co., Phila.
Neafie & Levy, Philadelphia	Tug Richmond	150	27	16	85,000		Tri. 16½, 24, 41 by 30; 1 Scotch		Coastwise Steamship Co., New York.
Neafie & Levy, Philadelphia	Tug Covington	150	27	16	85,000		Tri. 16½, 24, 41 by 30; 1 Scotch		Coastwise Steamship Co., New York.
Neafie & Levy, Philadelphia	Stmr. Northumberland	200	41	12	125,000		Tri. 18, 28, 45 by 30; 1 gunboat type		Weems Steamship Co., Baltimore.
Neafie & Levy, Philadelphia	Tug Dewitt C. Ivins	94	19	10½	30,000		Comp. 15, 30 by 22; 1 Scotch		M. Moran, New York.
Neafie & Levy, Philadelphia	Steel tug	94	19	10½	30,000		Comp. 15, 30 by 22; 1 Scotch		M. Moran, New York.
Neafie & Levy, Philadelphia	Steam barge	185	34	13			Comp. 20, 40 by 28		
Harlan & Hollingsworth Co., Wilmington	Stmr. Grecian	290	42	36	475,000	2550	Tri. 25, 41½, 68 by 42	2700	Boston & Philadelphia S. S. Co., Boston.
Harlan & Hollingsworth Co., Wilmington	Steamer	289	43	29	450,000	2200	Tri. 29, 46, 75 by 46		Metropolitan Steamship Co., New York.
Harlan & Hollingsworth Co., Wilmington	Tug Wilmington	100	22	12¼	75,000	175	Comp. 20, 40 by 26		Pennsylvania R. R. Co., Jersey City.
Harlan & Hollingsworth Co., Wilmington	Tug Harrisburg	100	22	12¼	75,000	175	Comp. 20, 40 by 26		Pennsylvania R. R. Co., Jersey C ty.
Harlan & Hollingsworth Co., Wilmington	Tug Johnstown	100	22	12¼	75,000	175	Comp. 20, 40 by 26		Pennsylvania R. R. Co., Jersey C ty.
Harlan & Hollingsworth Co., Wilmington	Stmr. Mauna Haute	219	32	23⅓	160,000	1000	Tri. 18, 28, 45 by 30		N. Y. & Baltimore Trans. Co., Phila.
Harlan & Hollingsworth Co., Wilmington	Stmr. Chesapeake	219	32	23⅓	160,000	1000	Tri. 18, 28, 45 by 30		N. Y. & Baltimore Trans. Co., Phila.
Roach Ship Yard, Chester, Pa	Stmr. Pennsylvania	256	36	16	250,000	1400	Four cy. triple; 4 Almy	3500	N. Y., P. & N. R. R. Co.
Roach Ship Yard, Chester, Pa	Stmr. American	435	51	33½	600,000	6000	Tri. single screw; 4 Scotch	2500	American-Hawaiian S. S. Co., New York.
Roach Ship Yard, Chester, Pa	Stmr. Hawaiian	435	51	33½	650,000	6000	Tri. single screw; 4 Scotch	2500	American-Hawaiian S. S. Co., New York.
Roach Ship Yard, Chester, Pa	Steamer	435	51	33½	600,000	6000	Tri. single screw; 4 Scotch	2500	American-Hawaiian S. S. Co., New York.
Wm. R. Trigg Co., Richmond, Va	Stmr. Saml. H. Lapeley	70	12	3½			Two single cy.; 1 locomotive	70	Presbyterian Board of Foreign Missions.
Maryland Steel Co., Sparrow's Point, Md.	Stmr. Pleiades	340	47	28	380,000	3600	Triple; 2 Scotch	1500	Boston Towboat Co., Boston.
Maryland Steel Co., Sparrow's Point, Md.	Stmr. Hyades	340	47	28	380,000	3600	Triple; 2 Scotch	1500	Boston Towboat Co., Boston.
Maryland Steel Co., Sparrow's Point, Md.	Steamer	300	52½	25	450,000	3000	Triple; 2 Scotch	2000	Metropolitan Dredging Co., New York.
Maryland Steel Co., Sparrow's Point, Md.	Steamer	300	52½	25	450,000	3000	Triple; 2 Scotch	2000	Metropolitan Dredging Co., New York.
Maryland Steel Co., Sparrow's Point, Md.	Steamer	75	17	7½	122,000	70	Compound; 1 Scotch	2160	C. Aguurro of Porto Rico.
Maryland Steel Co., Sparrow's Point, Md.	Barge	92	23	4½	6,500	75			C. Aguurro of Porto Rico.
Maryland Steel Co., Sparrow's Point, Md.	Barge	92	23	4½	6,500	75			C. Aguurro of Porto Rico.
Bath Iron Works, Bath, Me	Tug	120	26	17	100,000	375			N. Y., N. H. & H. R. R. Co.
Bath Iron Works, Bath, Me	Tug	120	26	17	100,000	375			N. Y., N. H. & H. R. R. Co.
Jackson & Sharp Co., Wilmington, Del.	Tug Eli B. Conine	93	20	9					A. Mackenzie, New York.
Jackson & Sharp Co., Wilmington, Del.	Tug Gerry	110	24	10½					National Dredging Co.
Jackson & Sharp Co., Wilmington, Del.	Lighter	120	30	9½					Munson Steamship Co., New York.
Jackson & Sharp Co., Wilmington, Del.	Lighter	120	30	9½					Munson Steamship Co., New York.
Jackson & Sharp Co., Wilmington, Del.	Lighter	115	30	9¼					Munson Steamship Co., New York.
Jackson & Sharp Co., Wilmington, Del.	Lighter	115	30	9½					Munson Steamship Co., New York.
Jackson & Sharp Co., Wilmington, Del.	Car float	250	33	8½					Pennsylvan'a R. R. Co.
Jackson & Sharp Co., Wilmington, Del.	Car float	250	33	8½					Pennsylvan'a R. R. Co.
Moran Bros. Co., Seattle	Ferryboat King County	126	32	8½		180	High pressure 14x72; 1 firebox		Commissioners of King County, Wash.
Moran Bros. Co., Seattle	Stmr. Dickinson	210	39	17		1100	Comp. 24, 48 by 33; 1 Scotch		Pacific Clipper Line, Seattle.
Moran Bros. Co., Seattle	Schooner	206	42	16		1000			Pacific Clipper Line, Seattle.
Moran Bros. Co., Seattle	Tug	128	25	15		360	Tri. 16, 24, 40 by 28; 2 Scotch		Puget Sound Tub Boat Co., Seattle.
Moran Bros. Co., Seattle	Tug	80	17½	9		95	Comp. 10, and 20 by 16; 1 Scotch		
Wolff & Zwicker Iron Works, Portland	Stmr. Kvichak	214	35	18	180,000	1250	Tri.; 2 Babcock & Wilcox	1000	Alaska Packers Assn, San Francisco.
Atlantic Works, East Boston	Tug	127	23	14½	90 000		Compound; 1 Scotch	500	C. F. Lyman, Boston.
Atlantic Works, East Boston	Tug	127	23	14½	90,000		Compound; 1 Scotch	500	C. F. Lyman, Boston.
William McKie, E. Boston	Stmr. City of Richmond	290	38	14½	300,000	1700	Beam engine	1600	Boston & Bangor S. S. Co., Boston.
William McKie, E. Boston	Ferryboat	164	37	14½	95,000	600	Compound	1000	City of Boston.
Geo. Lawley & Son Corp., S. Boston	Schooner	137	24	15	55,000	331			George L. Day, New York.
Geo. Lawley & Son Corp., S. Boston	Steamer	117	14	9	30,000		Triple; 1 Roberts	300	F. B. McQuisten, Boston.
Geo. Lawley & Son Corp., S. Boston	Schooner	70	15	8	11,000				S. H. Mason, New York.
Columbian I. W. & D. D. Co., Baltimore.	Tug Savage	149	27	16		390	Tri. 16, 24, 41 by 30; 2 Scotch	810	Consolidation Coal Co., Baltimore.
Columbian I. W. & D. D. Co., Baltimore.	Towboat	84	18½	9½			Comp. 14, 28 by 22; 1 Scotch	260	Hartford & N. Y. Trans. Co.
Columbian I. W. & D. D. Co., Baltimore.	Towboat	115	24	11			Comp. 20, 40 by 28; 1 Scotch	525	Hartford & N. Y. Trans. Co.
Gas Engine & Power Co., Morris Heights	Stm. yacht Elfrida	139	18	10	80,000		Triple; 1 Seabury	900	
Gas Engine & Power Co., Morris Heights	Yacht Saghaya	127	15½	9	48,000		Triple; 1 Seabury	450	
Gas Engine & Power Co., Morris Heights	Tug Crocker	110	21½	12	60,000		Triple; 1 Seabury	800	
Gas Engine & Power Co., Morris Heights	Schr. Barbara	70	15	15	15,500			24	
Gas Engine & Power Co., Morris Heights	Steam yacht	51	7	4	8,000		Triple; 1 Seabury	75	
Theo. A. Crane's Son, Brooklyn	Barge	100	30	8½	5,000				N. Y. C. & H. R. R. Co.
Theo. A. Crane's Son, Brooklyn	Barge	83	30	8	4,500				L. V. R. Ry. Co.
Theo. A. Crane's Son, Brooklyn	Towboat	96	21½	10	6,000				Beard Dredging Co., New York.
Theo. A. Crane's Son, Brooklyn	Barge	85	30	8½	4,800				Ward Steamship Co.
Theo. A. Crane's Son, Brooklyn	Barge	75	25	8½	4,850				N. Y. C. & H. R. R. Co.
Theo. A. Crane's Son, Brooklyn	Barge	75	25	8½	4,850				N. Y. C. & H. R. R. Co.
Theo. A. Crane's Son, Brooklyn	Barge	75	25	8½	4,850				N. Y. C. & H. R. R. Co.
Theo. A. Crane's Son, Brooklyn	Barge	75	25	8½	4,850				N. Y. C. & H. R. R. Co.
Theo. A. Crane's Son, Brooklyn	Barge	75	25	8½	4,850				N. Y. C. & H. R. R. Co.
Theo. A. Crane's Son, Brooklyn	Barge	75	25	8½	4,850				N. Y. C. & H. R. R. Co.
Theo. A. Crane's Son, Brooklyn	Barge	75	25	8¼	4,850				N. Y. C. & H. R. R. Co.
Theo. A. Crane's Son, Brooklyn	Barge	75	25	8¼	4,850				N. Y. C. & H. R. R. Co.
George H. Hutchings, Hoquiam, Wash.	Stmr. Robt. Dollar	208	38	16½	70,000	1000	Triple; 2 Babcock & Wilcox	600	Robert Dollar, San Francisco.
George H. Hutchings, Hoquiam, Wash.	Stmr. Rainier	213	38	17	100,000	1100	Triple; 2 Babcock & Wilcox	1000	Pollard & Dodge, San Francisco.
George H. Hutchings, Hoquiam, Wash.	Schooner	198	38½	16	48,000	700			E. K. Wood Co., San Francisco.
George H. Hutchings, Hoquiam, Wash.	Schooner	198	38½	16	48,000	700			Hind, Rolph & Co., San Francisco.
Thos. McCasker & Co., Baltimore	Tug Peerless	93	21	10	25,000	167	Steeple compound		P. Dougherty Co.
Thos. McCasker & Co., Baltimore	Tug Sarah	93	20	10	25,500	160	Steeple compound		Jas. Clark & Co.
Thos. McCasker & Co., Baltimore	Dredge	90	32	10	15,000				Baltimore Dredging Co.
Burlee D. D. Co., Port Richmond, S. I.	Barge					2200			Baker Trans. Co., New York.
Burlee D. D. Co., Port Richmond, S. I.	Tug					200			Capt. H. Hoffman, New York.
Burlee D. D. Co., Port Richmond, S. I.	Tug					260			Bee Line Trans. Co., New York.
Burlee D. D. Co., Port Richmond, S. I.	Tug					200			Easton & Amboy R. R. Co.
Burlee D. D. Co., Port Richmond, S. I.	Tug					200			Easton & Amboy R. R. Co.
Burlee D. D. Co., Port Richmond, S. I.	Tug					200			Easton & Amboy R. R. Co.
Burlee D. D. Co., Port Richmond, S. I.	Barge					500			Standard Oil Co., New York.
Burlee D. D. Co., Port Richmond, S. I.	Barge					500			Standard Oil Co., New York.
Burlee D. D. Co., Port Richmond, S. I.	Lighter					300			N. Y. Lighterage Co.
T. S. Marvel & Co., Newburgh, N. Y.	Tug					280			Philadelphia & Norfolk R. R. Co.
T. S. Marvel & Co., Newburgh, N. Y.	Tug					85			Cornell Steamboat Co.
T. S. Marvel & Co., Newburgh, N. Y.	Tug					85			Cornell Steamboat Co.
T. S. Marvel & Co., Newburgh, N. Y.	Ferryboat					1000			Brooklyn Ferry Co.
T. S. Marvel & Co., Newburgh, N. Y.	Ferryboat					1000			Brooklyn Ferry Co.
T. S. Marvel & Co., Newburgh, N. Y.	Ferryboat					1100			New York Central R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	316	36	10		1100			N. Y., N. H. & H. R. R. Co., New York.
Robt. Palmer Son Co., Noank, Ct.	Car float	316	36	10		1100			N. Y., N. H. & H. R. R. Co., New York.
Robt. Palmer Son Co., Noank, Ct.	Car float	246	36	10		860			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	246	36	10		86			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.

MERCHANT VESSELS BUILDING OR UNDER CONTRACT IN COAST SHIP YARDS—Continued.

BUILDERS.	Name and Type of Vessel.	Dimensions. Over all.	Beam Molded.	Depth Molded.	Approximate Value.	Estimated Gross Tonnage.	Engines and Boilers.	Estimated Horse Power.	Building for
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10	$	810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Car float	240	35	10		810			N. Y. C. & H. R. R. R. Co.
Robt. Palmer Son Co., Noank, Ct.	Barge Grafton	175	34	11		531			Staples Coal Co., Taunton, Mass.
Robt. Palmer Son Co., Noank, Ct.	Barge Remus	175	34	11		531			Staples Coal Co., Taunton, Mass.
Robt. Palmer Son Co., Noank, Ct.	Barge Shawmont	203	37	17		910			Reading Co., Philadelphia, Pa.
Robt. Palmer Son Co., Noank, Ct.	Barge Marion Chappell	260	43	21		1595			Thames Towboat Co., New London, Ct.
Robt. Palmer Son Co., Noank, Ct.	Barge	203	35	17		910			Central Ry. of New Jersey.
Robt. Palmer Son Co., Noank, Ct.	Barge	203	35	17		910			Central Ry. of New Jersey.
Robt. Palmer Son Co., Noank, Ct.	Tug Guiding Star	88	20	10		11			White Star Towboat Co., New York.
Robt. Palmer Son Co., Noank, Ct.	Tug	88	20	10		110			
Robt. Palmer Son Co., Noank, Ct.	Steam yacht Rosalie	90	20	8¾		40			E. W. Hooker, Hartford, Ct.
Robt. Palmer Son Co., Noank, Ct.	Schooner	200	38	17		1000			Builder's account.
Robt. Palmer Son Co., Noank, Ct.	Lighter Montauk	95	35	9		18			Manhattan L. & T. Co., New York.
Robt. Palmer Son Co., Noank, Ct.	Lighter Mineola	95	33	9		18			Manhattan L. & T. Co., New York.
Robt. Palmer Son Co., Noank, Ct.	Lighter	95	33	9		18			Manhattan L. & T. Co., New York.
Robt. Palmer Son Co., Noank, Ct.	Lighter	95	33	9		18			Manhattan L. & T. Co., New York.
C. D. Mosher, New York	Steam yacht Arrow	130	9 2¼	9½			Quadruple; water tube	4000	C. R. Flint, 30 Broad St., New York.
C. D. Mosher, New York	Steam yacht	81½	8	4½			High pressure 10 by 12; water tube		G. E. & C. H. Painter, Pittsburg.
Lewis Nixon, Elizabeth, N. J.	Fireboat				91,000				City of Buffalo.
Lewis Nixon, Elizabeth, N. J.	Steam yacht	147					Triple and watertube		Jas. Sibley, Watson, N. Y.
Arthur Sewall & Co., Bath, Me.	Barque Kaiulana	225	42	20	80,000	1570			Wm. Dimond & Co., San Francisco.
Kelley, Spear & Co., Bath, Me.	Barge Elk Garden	185	35	16	30,000	840			Davis Coal & Coke Co.
Kelley, Spear & Co., Bath, Me.	Barge	185	35	16	30,000	840			Davis Coal & Coke Co.
Kelley, Spear & Co., Bath, Me.	Schr. Calumet	195	40	18½	60,000	1100			J. S. Emery & Co.
Kelley, Spear & Co., Bath, Me.	Barge	165	34	10	20,000	475			Staples Coal Co.
Kelley, Spear & Co., Bath, Me.	Barge	165	34	10	20,000	47			Staples Coal Co.
Kelley, Spear & Co., Bath, Me.	Schooner	165	35	13	38,000	56			Chas. Hodgkins.
Kelley, Spear & Co., Bath, Me.	Tug Cohannet	80	20	8	20,000	9			Staples Coal Co.
New England Co., Bath, Me.	Schr. Mary W. Bowen	246	46	22	90,000	2153			Jos. A. Bowen.
New England Co., Bath, Me.	Barge Iowa	237	43	20	60,000	1606			Coastwise S. S. Co.
New England Co., Bath, Me.	Barge Indiana	237	43	20½	60,000	1675			Coastwise S. S. Co.
New England Co., Bath, Me.	Barge Georgia	237	43	20½	60,000	1675			Coastwise S. S. Co.
New England Co., Bath, Me.	Barge Benavadies	190	33	18	30,000	920			Bee Line Transportation Co.
New England Co., Bath, Me.	Barge Bee	190	33	18	30,000	92			Bee Line Transportat'on Co.
New England Co., Bath, Me.	Barge Black Diamond	190	33	18	30,000	920			Bee Line Transportation Co.
New England Co., Bath, Me.	Schooner	180	37	17	50,000	85			J. B. Drake.
G. G. Deering, Bath, Me.	Schooner	210	44	21	80,000	1800			Builder's account.
Percy & Small, Bath, Me.	Schr. Helen M. Martin	266	45	21½	95,000	2300			Builder's account.
Percy & Small, Bath, Me.	Schooner	265	46	22	105,000	2400			J. S. Winslow & Co.
Percy & Small, Bath, Me.	Schooner	300	50	24	125,000	3200			Builder's account.
T. S. Bowker, Bath, Me.	Schooner	130	33	11	25,000	40			
T. S. Bowker, Bath, Me.	Schooner	155	35	12	35,000	600			
C. V. Minott, Bath, Me.	Schooner				72,000	160			
C. V. Minott, Bath, Me.	Schooner				65,000	140			
William Rogers, Bath, Me.	Schr. Marie Palmer	235	43	24	75,000	190			William F. Palmer.
William Rogers, Bath, Me.	Schr. Maud Palmer	214	42	22	70,000	170			William F. Palmer.
W. T. Donnell, Bath, Me.	Schooner				75,000	180			Builder's account.
Jno. Twigg & Sons, San Francisco	Steamer	67	16	6	11,000	38	Compound; 1 Scotch		Alaska Packers' Association.
Jno. Twigg & Sons, San Francisco	Towboat	55	14	6	6,500	2	Compound; 1 Scotch		Alaska Packers' Association.
Jno. Twigg & Sons, San Francisco	Towboat	50	12	6	5,000	18	Compound; 1 Scotch		Alaska Packers' Association.
Jno. Twigg & Sons, San Francisco	Barge	55	18	4½	3,600				Alaska Packers' Association.
Jno. Twigg & Sons, San Francisco	Barge	55	18	4½	3,600				Alaska Packers' Association.
H. D. Bendixen, Eureka, Cal.	Stmr. Hueneme	237	38	17					Gray & Mitchell, San Francisco.
H. D. Bendixen, Eureka, Cal.	Schooner	150	32	11					McCollam F. & T. Co., San Francisco.
H. D. Bendixen, Eureka, Cal.	Schooner	190	36	14					Shingle Mfg. Assn., Eureka, Cal.
H. D. Bendixen, Eureka, Cal.	Barkentine	230	42	18					Sudden & Christensen, San Francisco.
H. D. Bendixen, Eureka, Cal.	Schr. S. T. Alexander	175	38	16		780			Chas. Nelson, San Francisco.
Hartford & N. Y. Trans. Co., Hartford	Barge	185	35¼	13	20,000	800			Builder's account.
Hartford & N. Y. Trans. Co., Hartford	Barge	185	35½	13	20,000	800			Builder's account.
Sawyer Bros., Millbridge, Me.	Schooner	170	35	12	36,000	550	Boiler by HydeWindlass Co.		Capt. J. F. Hinkley, Woodfords, Me.
Wm. H. Baldwin, New Baltimore, N. Y.	Stmr. Frank Richards	69	16½	7	9,500	67	Upright 14by 16; 1 longitudinal		Pratt & Ward, West Troy, N. Y.
Wm. H. Baldwin, New Baltimore, N. Y.	Steamer	70	17	7½	10,000	76	Upright 14by 16; 1 longitudinal		Capt. W. P. Smith, Rennslaer, N. Y.
H. M. Bean, Camden, Me.	Schr. Malcolm Baxter, Jr.	240	45	25	75,000	1600			George Bailey, Manasquam, N. Y.
H. M. Bean, Camden, Me.	Schooner	340	48	22	120,000	3000			J. G. Crowley, Taunton, Mass.
H. M. Bean, Camden, Me.	Schooner	285	46	22	95,000	2200			J. G. Crowley, Taunton, Mass.
McCausland & Co., Rondout, N. Y.	Barge	103	25	12¼	4,000				
McCausland & Co., Rondout, N. Y.	Barge	103	25	12¼	4,000				
McCausland & Co., Rondout, N. Y.	Barge	105	26	12¼	4,500				
Peter L. Colon, Jersey City, N. J.	Barge	112	35	10½	13,000	1000			Brown & Fleming, Broad St., New York.
Peter L. Colon, Jersey City, N. J.	Barge	112	35	10½	13,000	1000			
Daimler Mfg. Co., Long Island City, N. Y.	Launch	51	8	4	8,000	15	Daimler motor	20	U. S. Customs Dept., Cuba.
Daimler Mfg. Co., Long Island City, N. Y.	Launch	85	16	5	12,000	40	Daimler motor	16	Florida East Coast Hotel Co., St. Augus.
S. Gildersleeve & Sons, Gildersleeve, Ct.	Barge	105	24	12	5,000	270			
S. Gildersleeve & Sons, Gildersleeve, Ct.	Barge	105	24	12	5,000	270			
S. Gildersleeve & Sons, Gildersleeve, Ct.	Barge	121	24	12	6,000	330			
S. Gildersleeve & Sons, Gildersleeve, Ct.	Barge	121	24	12	6,000	330			
Clay Johnson, Kissimee, Fla.	Steamer	69	14½	4	3,000	80	Two 6 by 24 high pressure	3	Builder's account.
Brannon & Southerland, Grassy Pt., N. Y.	Barge	112	33	9	6,000	400			Morrissey Bros., Grassy Point, N. Y.
Pamlico Rys., Washington, N. C.	Tug Nautilus	65	14	5½	4,000		Quadruple	100	Jas. H. Harris, Washington, N. C.
George Frenz, Scranton, Miss.	Barge	100	29½	7½	2,800				National Dredging Co., Wilmington.
Booz Bros., Baltimore, Md.	Lighter	85	24	7	3,000	250			
Geo. K. Phillips & Co., Bethel, Del.	Schooner	130	24	8	10,000	190			O. V. Wootten, Laurel, Del.
Sherwood, Embree & Bros., Quincy Pt., Mass.	Yacht	61	16	5	7,000	25			J. L. Sturtevant, Quincy, Mass.
Washburn Bros., Thomaston, Me.	Schooner	195	40½	19	50,000	1075			Builder's account.
Washburn Bros., Thomaston, Me.	Schooner	135	30	10	25,000	35			Builder's account.
Washburn Bros., Thomaston, Me.	Schooner	205	42	19	70,000	1300			Builder's account.
William S. Currier, Newburyport, Mass.	Schooner	20	39	19	52,000	900			Capt. F. S. Stiles, New York.
Wm. Skinner & Sons Co., Baltimore, Md.	Barge	200	35	17	35,000	90			Builder's account.
Jno. M. Brooks, East Boston, Mass.	Schr. Future	180	35	14	45,000	55			R. R. Freeman, Commercial St. Boston.
Jno. M. Brooks, East Boston, Mass.	Dredge	110	45	12	75 000	40	Compound		Pan-American Dredging Co., Boston.
Jno. Bishop, Gloucester, Mass.	Schooner	117	24	11	14,000	133			W. H. Jordan.
Jno. Bishop, Gloucester, Mass.	Schooner	125	25	10	22,000	16			Capt. Solomon Jacobs.
Enoch Moore & Sons Co., Wilmington	Barge	162	23¼	12½	20,000	700			Atlantic Refining Co., Philadelphia.
H. E. Elderkin & Co., Pt. Greville, N. S.	Schooner	120	30	10½	11,500	260			Builder's account.
H. E. Elderkin & Co., Pt. Greville, N. S.	Schooner	105	28	10	8,000	15			Builder's account.

SUPPLEMENTAL.—Addit'onal particulars of the vessels listed as building at the yard of T. S. Marvel & Co., Newburgh, N. Y., came to hand after the above table had been placed in type. The twin screw tug Delmar is of steel, 131 feet in length over all, 26 feet molded beam, 12 feet 9 inches in depth and of 250 gross tons register. This vessel, which will cost $75,000, is fitted with two compound engines of 800 horse power and two Scotch boilers. She is building for the N. Y., P. & N. R. R. Co. The two ferryboats, building at a cost of $175,000 each for the Brooklyn Ferry Co. of New York City, are of steel and of the following dimensions: Length over all, 193 feet; beam, 37 feet; breadth, over all, 62 feet; depth, 15 feet; gross tonnage, 1,100. They are fitted with beam engines. A screw ferryboat building for the N. Y. C. & H. R. R. R. Co. is 208 feet in length, 40 feet beam and 19 feet depth. She will cost $18,000, and is fitted with two compound engines of 1,300 horse power and two Scotch boilers. Building for the same company are two steel tugs, the contract price of each of which is $55,000. Each of these vessels is 108 feet in length, 23 feet beam, 12 feet depth and of 165 gross tons burden. The wooden barge building for the Collyer Co. of New York is 130 feet in length, 32 feet beam, 9½ feet depth and of 250 tons. It will cost $75,000. Two steel tugs are building for the Cornell Steamboat Co. Each is 75 feet in length, 19 feet beam and 9 feet depth, with 250 horse power compound engines and Scotch boilers. Each tug will cost, when completed, $20,000.

Hall Brothers of Point Blakely, Wash., have five wooden schooners contracted for or building. The four-masted schooner Helene is 218 feet over all, 39 feet beam, 17 feet depth and of 927 gross tons burden. She is building for Allen & Robinson of Honolulu, at a cost of $55,000. The schooner for the Point Blakely Mill Co. of Point Blakely, Wash., is 180 feet length, 36 feet beam and 13½ feet depth. For C. A. Hooper & Bro. of San Francisco there is a schooner 200 feet over all, 38 feet beam and 15 feet depth. For builder's account there are on the stocks or contracted for three vessels. The first of these is of the same dimensions as the vessel for the Point Blakely Mill Co., and the others are of 235 and 200 feet length respectively. The latter vessel is a sister craft of the schooner building for C. A. Hooper & Bro.

MERCHANT VESSELS UNDER CONTRACT IN SHIP YARDS OF THE GREAT LAKES.

	Type.	Dimensions. Over All.	Beam Moulded.	Depth Moulded.	Approximate Value.	Estimated Capacity. Gross Tons. 18 Feet.	Engines and Boilers.	Estimated Horse Power.	Building for
American Ship Bldg. Co., Lorain works..	Cargo Stmr.	498	52	30	360,000	7,900	Quad. 16½, 25, 38½,60x40; B.&W. water tube	1,800	American S. S. Co. (A. B. Wolvin)
American Ship Bldg. Co., Lorain works..	Cargo Stmr.	498	52	30	360,000	7,900	Quad. 16½, 25, 38½,60x40; B.&W. water tube	1,800	American S. S. Co. (A. B. Wolvin)
American Ship Bldg. Co., Lorain works..	Cargo Stmr.	474	50	28½	340,000	7,300	Quad. 18, 26¾, 41, 63x42; B.&W. water tube	1,950	Pittsburg S. S. Co. (Carnegie)
American Ship Bldg. Co., Lorain works..	Cargo Stmr.	474	50	28½	340,000	7,300	Quad. 18, 26¾, 41, 63x42; B.&W. water tube	1,950	Pittsburg S. S. Co. (Carnegie)
American Ship Bldg. Co., Lorain works..	Canal Stmr.	256	42	26½	170,000	3,000	Trip. 20, 33, 54x40; 2 Scotch	950	R. R. Rhodes, Cleveland.
American Ship Bldg. Co., Cleveland works	Cargo Stmr.	490	50	29	360,000	6,900	Quad. 26½, 37, 54½, 80x42; 4 Scotch	2,800	Bessemer S. S. Co. (Rockefeller)
American Ship Bldg. Co., Cleveland works	Cargo Stmr.	436	50	28	320,000	6,100	Trip. 23, 37½, 63x42; 3 Scotch	1,600	John Mitchell, Cleveland.
American Ship Bldg. Co., Cleveland works	Canal Stmr.	256	42	26½	170,000	3,000	Trip. 18½, 31½, 51x36; 2 Scotch	850	American S. S. Co. (A. B. Wolvin)
American Ship Bldg. Co., Cleveland works	Canal Stmr.	256	42	26½	170,000	3,000	Trip. 18½, 31½, 51x36; 2 Scotch	850	American S. S. Co. (A. B. Wolvin)
*Chicago Ship Bldg. Co	Cargo Stmr.	461	50	29½	330,000	6,800	Quad. 20½, 30, 43½, 63x42; 3 Scotch	2,000	Bessemer S. S. Co. (Rockefeller)
*Chicago Ship Bldg. Co	Cargo Stmr.	474	50	28½	340,000	7,300	Quad. 18, 26¾, 41, 63x42; B.&W. water tube	1,950	Pittsburg S. S. Co. (Carnegie)
*Chicago Ship Bldg. Co	Cargo Stmr.	474	50	28½	340,000	7,300	Quad. 18, 26¾, 41, 63x42; B.&W. water tube	1,950	Pittsburg S. S. Co. (Carnegie)
*Chicago Ship Bldg. Co	Tow barge..	414	50	27	175,000	5,900			Pittsburg S. S. Co. (Carnegie)
*Chicago Ship Bldg. Co	Tow barge..	450	50	28½	190,000	7,450			Minnesota S. S. Co., Cleveland.
*Chicago Ship Bldg. Co	Tow barge..	450	50	28½	190,000	7,450			Minnesota S. S. Co., Cleveland.
*Detroit Ship Bldg. Co	Pass. Stmr.	....	...	.....	300,000	.....	Trip. 33, 51, 82x72; 7 Scotch	3,000	B. W. Parker and others, Detroit.
*Detroit Ship Bldg. Co	Cargo Stmr.	432	50	28	320,000	6,100	Trip. 22, 35, 58x42; 2 Scotch	1,400	A. McVittie and others, Detroit.
*Detroit Ship Bldg. Co	Cargo Stmr.	474	50	28½	340,000	7,300	Quad. 18, 26¾, 41, 63x42; B.&W. water tube	1,950	Pittsburg S. S. Co. (Carnegie)
*Detroit Ship Bldg. Co	Cargo Stmr.	446	50	28	325,000	6,400	Trip. 22, 35, 58x42; 2 Scotch	1,400	Eddy Bros., Bay City, Mich.
*Detroit Ship Bldg. Co	Cargo Stmr.	446	50	28	325,000	6,400	Trip. 22, 35, 58x42; 2 Scotch	1,400	Eddy Bros., Bay City, Mich.
*West Bay City Ship Bldg. Co	Cargo Stmr.	498	52	30	360,000	7,900	Quad. 16½, 25, 38½,60x40; B.&W. water tube	1,800	American S. S. Co. (A. B. Wolvin)
*West Bay City Ship Bldg. Co	Cargo Stmr.	498	52	30	360,000	7,900	Quad. 16½, 25, 38½,60x40; B.&W. water tube	1,800	American S. S. Co. (A. B. Wolvin)
*Superior Ship Bldg. Co	Cargo Stmr.	461	50	29½	330,000	6,800	Quad. 20½, 30, 43½, 63x42; 3 Scotch	2,000	Bessemer S. S. Co. (Rockefeller)
Craig Ship Bldg. Co., Toledo, O	Canal Stmr.	260	42	25	170,000	3,000	Trip. 19, 30, 50x40; 2 Scotch	900	Arthur Hawgood, Cleveland.
Craig Ship Bldg. Co., Toledo, O	Pass. Stmr.	200	32	13½	125,000	1,200	Trip. 20, 32, 54x30; 4 water tube	1,000	Geo. T. Arnold, Mackinaw, Mich.
Craig Ship Bldg. Co., Toledo, O	Canal Stmr.	260	40	18½	170,000	3,000	Trip. 20, 32, 55x40; 2 Scotch	950	J. L. Crosthwaite, Buffalo.
Union Dry Dock Co., Buffalo	Pckg. Fr'tr.	404	50	28	340,000	5,000	Quad. 20½, 29¼, 43½, 63x42! 3 Scotch	2,100	Lehigh Valley Trans. Co., Buffalo.
Union Dry Dock Co., Buffalo	Canal Stmr.	258	40	18¼	170,000	3,000	Trip. 20, 33, 54x40; 2 Scotch	950	J. L. Crosthwaite, Buffalo.
Bertram Engine Works, Toronto	Canal Stmr.	257	43	25½	170,000	3,000	Trip. 17, 28, 46x32; 1 Scotch	750	J. R. Booth, Ottawa, Ont.
Bertram Engine Works, Toronto	Canal Stmr.	257	43	25½	170,000	3,000	Trip. 17, 28, 46x32; 1 Scotch	750	A syndicate.
Jenks Ship Bldg. Co., Port Huron, Mich.	Cargo Stmr.	440	50	28	320,000	6,100	Trip. 23, 38, 63x40; 3 Scotch	1,600	Capt. Thos. Wilson, Cleveland.
Jenks Ship Bldg. Co., Port Huron, Mich.	Canal Stmr.	257	43	26½	170,000	3,000	Trip. 17½, 28, 47x40; 2 Scotch	800	Capt. Thos. Wilson, Cleveland.
Jas. Davidson, West Bay City, Mich	Tow barge..	....	...	.....	90,000	4,500			Builder's account.
Calvin Co., Kingston, Ont	Tow barge..	200	40	16	30,000	1,600			Calvin Co., Kingston, Ont.
Alex Anderson, Marine City, Mich	Sand Stmr..	150	38	9	22,000	.....	Not determined as yet	200	John Corrigan, Cleveland.
Alex Anderson, Marine City, Mich	Tow barge..	290	41	.....	40,000	3,000			Edward Carter, Erie, Pa.
S. Langell, St. Clair, Mich	Cargo Stmr.	265	40	22	100,000	2,700	Comp. 23, 48x40; 1 Scotch	750	Builder's account.
					$8,902,000	185,500		45,950	

*Controlled by American Ship Building Co.

MERCHANT VESSELS BUILDING OR UNDER CONTRACT ON WESTERN RIVERS.

BUILDERS.	Type and Name.	Dimensions, Over all,	Beam,	Depth.	Approximate Value.	Estimated Gross Tonnage.	Engines and Boilers.	Estimated Horse Power,	Building for
Iowa Iron Works, Dubuque, Ia	Steam tender Sachem..	199	36	5½	$70,000	.....	High pressure, Miss. type	1000	Mississippi River Commission, St. Louis.
Iowa Iron Works, Dubuque, Ia	Steam tender Choctaw	199	36	5½	70,000	.....	High pressure, Miss. type	800	Mississippi River Commission, St. Louis.
Iowa Iron Works, Dubuque, Ia	Steam tender Wynoka.	169	36	5½	70,000	.....	High pressure, Miss. type	800	Mississippi River Commission, St. Louis.
Iowa Iron Works, Dubuque, Ia	Steam tender Nokomis	199	36	5½	70,000	.....	High pressure, Miss. type	800	Mississippi River Commission, St. Louis.
Iowa Iron Works, Dubuque, Ia	Steam tender Leota....	199	36	5½	70,000	.....	High pressure, Miss. type	800	Mississippi River Commission, St. Louis.
Howard's Ship Yard, Jeffersonville, Ind..	Stmr. Rowena Lee.....	200	38	6	.....	.....	High pressure, Miss. type	.....	Lee Line.
Howard's Ship Yard, Jeffersonville, Ind..	Stmr. Bayless Lee.....	200	38	6	.....	.....	High pressure	.....	Lee Line.
Howard's Ship Yard, Jeffersonville, Ind..	Stmr. New Bostona....	285	47	7	.....	.....	High pressure	.....	Cincinnati & Louisville Mail Line.
Howard's Ship Yard, Jeffersonville, Ind..	Steel tender.....	100	24	4	.....	.....	High pressure	.....	U. S. Government.
Howard's Ship Yard, Jeffersonville, Ind..	Steel tender.....	100	24	4	.....	.....	High pressure	.....	U. S. Government.
Howard's Ship Yard, Jeffersonville, Ind..	Steel tender.....	100	24	4	.....	.....	High pressure	.....	U. S. Government.
Howard's Ship Yard, Jeffersonville, Ind..	Barge.....	130	30	7	.....	.....		.....	
David S. Barmore, Madison, Ind	Stmr. War Eagle.....	250	35	6½	65,000	1500		.....	Eagle Packet Co., St. Louis, Mo.
David S. Barmore, Madison, Ind	Stmr. Alma Barrett....	225	40	8	10,000	2200		.....	John Barrett & Son, Cincinnati.
David S. Barmore, Madison, Ind	Stmr. Ammie Barrett..	225	40	8	10,000	2200		.....	John Barrett & Son, Cincinnati.
David S. Barmore, Madison, Ind	Stmr. Nightingale.....	225	38	7	9,000	1200		.....	Huntington & St. Louis Towboat Co.
David S. Barmore, Madison, Ind	Stmr. Eclipse.....	225	38	7	9,000	1200		.....	Huntington & St. Louis Towboat Co.
David S. Barmore, Madison, Ind	Stmr. Pacific.....	225	38	7	9,000	1200		.....	Huntington & St. Louis Towboat Co.
Elizabeth Marine Ways Co., Elizabeth, Pa.	Stmr. Tide.....	135	23	4	17,000	130	Two single; 2 boilers	.....	Tide Coke Co., Pittsburg.
Elizabeth Marine Ways Co., Elizabeth, Pa.	Steamer.....	155	23	4	28,000	148	Two single; 3 boilers	...	American Coke Co., Pittsburg.
Elizabeth Marine Ways Co., Elizabeth, Pa.	Steamer.....	155	23	4	28,000	148	Two single; 3 boilers	.....	American Coke Co., Pittsburg.
Elizabeth Marine Ways Co., Elizabeth, Pa.	Barges (40).....	100	24	8	1,600	325		.....	American Coke Co., Pittsburg.
Elizabeth Marine Ways Co., Elizabeth, Pa.	Barges (6).....	124	30	17	5,000	500		.....	U. S. Government.
Elizabeth Marine Ways Co., Elizabeth, Pa.	Barges (100).....	170	26	0	700	1840		.....	Monongahela R. Coal & Coke Co., Pitts.
Jas. Rees & Sons Co., Pittsburg, Pa	Stmr. Juniata.....	135	25	4	.....	.....	High pressure; 3 boilers	.....	American Coke Co., Pittsburg.
Jas. Rees & Sons Co., Pittsburg, Pa	Stmr. Braddock.....	135	25	4	.....	.....	High pressure; 3 boilers	.....	American Coke Co., Pittsburg.
Springfield Boiler Co., Springfield, Ill	Dredge.....	125	30	8	17,000	.....		.....	Mississippi R. Commission, New Orleans.
Springfield Boiler Co., Springfield, Ill	Dredge Iota.....	199	75	7½	108,000	.....	Single; 7 Miss. type boilers	.....	Mississippi R. Commission, New Orleans.
Springfield Boiler Co., Springfield, Ill	Dredge Kappa.....	199	75	7½	117,000	.....	Single; 7 Miss. type boilers	.....	Mississippi R. Commission, New Orleans.
Springfield Boiler Co., Springfield, Ill	Dredge Lambla.....	199	75	7½	117,000	.....	Single; 7 Miss. type boilers	.....	Mississippi R. Commission, New Orleans.
W. G. Knox & Son, Marietta, O	Stmr. F. J. Torrence...	216	34	6	50,000	.....	Single 20 in. by 8 ft. stroke	.....	Monongahela & Ohio R. Trans. Co., Pitts.
Mozena Bros., Clarington, Ohio	Stmr. City of Wheeling	168	34	4½	20,000	300	2 en. 16 in. by 6 ft. stroke, 3 boilers.	.....	LeRoy Steamboat Co., Clarington, O.
Ruell O. Arnold, Leavenworth, Ind	Barges (60).....	40½	16	3	.....	.....		....	Mississippi River Commission.
Ruell O. Arnold, Leavenworth, Ind	Barges (4).....	100	22	6	.....	.....		.....	Green River Coal Co.
Ruell O. Arnold, Leavenworth, Ind	Barge.....	72	22	4	.....	.....		.....	Mississippi River Commission.

M. I. Godfrey, Wabasha, Minn., is building a stern-wheel steamer of 100 feet length, valued at $6,000, for Geo. Winans, Waukesha, Wis.

BUILDERS OF SMALL CRAFT.

REPORTS OF NUMEROUS ORDERS FOR SMALL VESSELS NOT CONTAINED IN THE TABLES THAT ARE PRINTED ON OTHER PAGES.

A. M. Gammage of South Bristol, Me., is building a wooden sailing vessel 50 feet in length, 15 feet beam and 6 feet depth for E. A. Leavitt of Biddeford Pool, Me. The cost will be $2,000.

Dunn & Elliott of Thomaston, Me., tell the Review that while they have no vessels on the stocks at present they contemplate building one or perhaps two wooden schooners during the coming summer.

J. S. Ellis & Son, Tottenville, Staten Island, N. Y., have recently submitted bids for the construction of a 100-foot tug and some coal barges and expect to have considerable new work under way shortly.

The Truscott Boat Manufacturing Co. of St. Joseph, Mich., is now confining itself to the construction of launches 50 feet and under in length, and have almost one hundred vessels of this description now under way.

The New Albany Manufacturing Co. of New Albany, Ind., is furnishing poppet valve engines of 16 inches diameter of cylinder by 7 feet stroke for a stern-wheel steamer which is building at Mobile, Ala., for Capt. N. A. Staples.

The Greenport Basin & Construction Co. of Greenport, N. Y., is building an auxiliary sloop 45 feet over all, 15 feet beam and 5 feet depth, which will be fitted with a Globe gas engine. The vessel will cost $4,000 and is designed for P. S. Taber of Orient, N. Y.

W. B. Stearns of Marblehead, Mass., has on the stocks a large number of small sail yachts. Among the number are one 40 feet in length for H. A. Church; a 38-footer for F. Dexter; one of 36 feet length for R. M. Hoe; and a 25-foot yacht for F. E. Peabody.

Embree Brothers, yacht and boat builders of Quincy Point, Mass., have about concluded contracts for a 48-foot auxiliary pleasure yawl to cost $5,000 and for a 40-foot pleasure launch to cost $3,000. Each will be fitted with a gas motor manufactured by M. E. Bray of Quincy, Mass.

Miller & Schreimer, Dubuque, Iowa, are building a lot of flatboats for use by private contractors in dam construction on the Mississippi river. They are in two sizes, those of 100 feet length having been contracted for at $950 each while those of 140 feet length are valued at $1,250 each.

Samuel Ayers & Son of Nyack, N. Y., are at the present time build-

ing sixty-six launches, fitted with electric motors, for the Electric Launch Co. of New York city. Sixty of these vessels are each 30 feet in length by 6 feet beam, while the remainder are 36 feet in length over all by 7 feet beam.

Davidson & Griffin of South Portland, Me., are building two sail yachts of 25 and 35 feet in length respectively. One of them for a Portland, Me., party of yachtsmen will cost $400, while the second boat, under construction for Edward Woodman of Portland, Me., will cost $2,500.

The Gas Engine & Power Co. and Charles L. Seabury Co., Consolidated, of Morris Heights New York city, is building to order twenty-one open and cabin naphtha launches, ranging from 16 to 55 feet in length. They also have under way two wooden steam launches, each 30 feet in length, which will be fitted with Seabury compound engines and water tube boilers.

H. M. Bean, the Camden, Me., ship builder, writes the Review that he is making excellent progress on the schooners under construction at his yard. The four-masted schooner building for Capt. G. Bailey is ceiled and planking has been commenced. It will be launched about March 1. Of the schooners building for Capt. J. G. Crowley, the six-master will be launched in July and the five-master in September.

John Twigg & Sons of San Francisco, Cal., have work on hand which is taxing the capacity of their yard. In addition to the vessels listed in the table to be found elsewhere in this issue, they are building several towboats, each under 50 feet in length, for the Alaska Packers Association; two cabin launches and two barges for the same parties; twenty fishing boats, fifteen yawls and nine small launches.

James M. Bayles & Son of Port Jefferson, N. Y., have two contracts on hand. One is for the auxiliary schooner-yacht Intrepid for Frank M. Palmer of New York. She is of wood, 66 feet in length, 18 feet beam, and 6 feet depth and will be fitted with an American Motor Co. motor of 30 horse power. The vessel will cost $8,000. The other vessel is a $10,000 yacht of almost the same dimensions for Henry C. Tucker of New York city.

Green Bros. of Bridgeport, Conn., are building two oyster dredging steamers, to be delivered March 1, 1900. One 48 feet over all, 13½ feet beam and 5 feet depth is for Capt. E. F. Lockwood of Cos Cob, Conn. The other, 40 feet in length over all, 12 feet beam and 4 feet depth is building at a cost of $3,000 for Jeremiah Smith & Sons of New Haven. Conn. Both vessels are fitted with Globe gas engines, manufactured by the Penn Iron Works of Philadelphia.

Filmore A. Baker of Patchoque, Long Island, N. Y., has on hand the following work: One auxiliary schooner of wood, 50 feet in length, 16 feet beam, 4½ feet depth and fitted with a Daimler gasoline engine of 25 horse power, building for William Dorman of Jamaica Bay, N. Y.; sail yacht, 45 feet over all, 16 feet beam, 4½ feet depth, cost $1,600, for D. Van Poprin of West Sayville, Long Island; wooden steam launch, 44 feet in length, 11 feet beam, 4 feet depth, to cost $2,000, for builder's account.

Mr. V. D. Bacon of the Cape Cod Yacht Agency, Barnstable, Mass., has been so unfortunate as to have been confined to the house for the past 6 months, as the result of an accident last summer. The only work which he has been able to do is the preparation of plans for a 25-foot racing yacht which will be built by W. P. Kirk of Tour River, N. J., and for a 60-foot schooner to be built in San Francisco. The Cape Cod Agency is now figuring upon some new work, however, and will in all probability close contracts for it within a short time.

Stanley C. Vansant of Atlantic City, N. J., has quite a line of small work on hand. It includes a knockabout yacht 40 feet in length, 13½ feet beam and 4 feet depth, to cost $1,500, for E. A. McGuire of Atlantic City, N. J.; sloop yacht 60 feet in length, 15 feet beam and 5½ feet depth, to cost $3,500, for E. A. Parker of Atlantic City, N. J.; cat boat 36 feet in length, 14 feet beam, 4 feet depth, to cost $900, for D. Headley of Atlantic City, N. J.; knockabout yacht 41 feet over all, 13½ feet beam, 4½ feet depth, to cost $1,500, for U. Hichman of Atlantic City, N. J.; launch, 30 feet over all, 6½ feet beam, 3 feet depth, to cost $1,200, for J. C. White of Atlantic City. He is also building fifteen or twenty small boats which will cost from $75 to $150 each.

NEW YORK AND CUBA MAIL SHIPS.

Washington, D. C., Feb. 7—Charles H. Cramp of the Cramp ship building company had a conference Monday with Secretary Long, Assistant Secretary Allen and Rear Admiral Rodgers, president of the Naval Board of Inspection and Review, on the question of building four vessels for the New York & Cuba Mail and Steamship Co. Under the act of March 3, 1899, the builders of the vessels, in order to obtain a subsidy from the government, must construct the vessels so that they can be converted into auxiliary cruisers if at any time the government should need them. The plans for the vessels have been prepared at the Cramps works. They will be submitted to the board of inspection and if found correct they will be constructed by the Cramps and the government will pay the subsidy.

The house committee on merchant marine has listened to all the arguments pro and con on the shipping bill and has the measure now under consideration. An endeavor will be made to report the bill promptly to the house.

Members of the Marine Engineers' Beneficial Association, who attended the last meeting of the national association in Washington, say that neither the question of wages on the great lakes nor the removal of the name "engineer" from the wage card of the Lake Carriers' Association were discussed in any way. They say that newspaper dispatches to that effect are entirely erroneous. The opinion was expressed, so they say, that a new class should be established in the grading of wages of the engineers of the 500-foot steamers now coming into service.

A YEAR'S WORK AT BATH, ME.

In the general summary in this issue of ship building throughout the United States particulars are given of vessels now under construction at Bath, Me., as in all the other ship building districts. The Bath correspondent of the Marine Review also sends a list of vessels completed during 1899, which will prove interesting in connection with the summary of work still under way that appears on other pages. It may be noted that the vessels built by the Bath Iron Works and Arthur Sewall & Co. are of steel; all others are of wood.

VESSELS BUILT AT BATH, ME., 1899.

		Gross tons.
New England Co.,	Barge No. 8	924
" " "	Barge No. 9	909
" " "	Barge No. 12	930
" " "	Barge No. 14	927
" " "	Barge No. 15	912
" " "	Barge No. 16	929
" " "	Barge No. 17	935
" " "	Barge Bath	926
" " "	Barge Bangor	931
Kelley, Spear & Co.,	Barge Wilmore	844
" " "	Barge Thaxter	843
" " "	Barge Darby	1513
" " "	Barge Malvern	844
" " "	Barge No. 11	953
" " "	Barge Oxford	836
" " "	Barge Pemberton	839
" " "	Barge Upton	843
" " "	Barge No. C.	1035
" " "	Barge Sunbury	1544
" " "	Barge Tipton	830
" " "	Barge No. 18	936
" " "	Barge Solus	839
" " "	Barge No. 19	932
" " "	Barge No. 20	940
" " "	Barge Edith	859
" " "	Barge Ohio	1629
Rogers, Wm.,	Barge New York	1688
Percy & Small,	Schr. M. D. Cressy	2114
Deering, Gardiner G.,	Schr. Henry O. Barrett	1807
Sewall & Co., Arthur,	Ship Arthur Sewall	3209
" " " "	Ship Edward Sewall	3206
Bath Iron Works,	Steam yacht Aphrodite	1147
" " "	Steam yacht Virginia	441
" " "	Training Ship Chesapeake	*1200
" " "	Torpedo boat Dahlgren	*150

*Tons in these two cases represent displacement.

SUMMARY—MERCHANT VESSELS BUILT AT BATH, 1899.

	Gross tons.	Net tons.
Two ships	6,415	5,835
Two schooners	3,921	3,448
Three steamers	1,697	936
Twenty-seven barges	27,070	24,106
Two sloops	17	13
Total, 36 vessels	39,120	34,338

MODELS FOR PARIS EXPOSITION.

Mr. Charles D. Mosher, Engineer and Naval Architect, No. 1 Broadway, New York city, has just shipped, to be exhibited at the Paris Exposition, a number of full rigged models of the fastest yachts and launches he has built and building, among which is the steam yacht Ellide with a record of 40.2 miles per hour, which was built for Mr. E. B. Warren of Philadelphia; also a fully rigged model of the twin-screw steam yacht Presto, which he built for Mr. J. A. Mollenhauser of Brooklyn, with a speed of 31 miles per hour; and the twin-screw electric yacht Utopian, built for John Jacob Astor of New York, this yacht being the largest electric yacht ever built. She was fitted with auxiliary sail power and has a speed of 14 miles per hour. Mr. Mosher sent also a model of the steam launch Viper, built for F. P. Magoun of Babylon, L. I., with a speed of 36 miles per hour; a model of the twin screw steam yacht Fox, for Richard K. Fox of New York, with a speed of 33 miles per hour, and a model of the 180-foot twin-screw steam yacht Pocahontas. The Pocahontas will have a speed of 33 knots per hour and has very extensive and elaborate accommodations and bunker capacity, enabling it to steam 4,000 miles. A model is being constructed for the exposition of the 130-foot twin-screw yacht Arrow, which is being built for Charles R. Flint of New York. This yacht will unquestionably be the fastest vessel ever constructed, as she is fitted with very much higher power machinery than has ever been placed in any vessel of her size, having no less than 4,000 horse power on a displacement of 50 tons. It is claimed that she will have a speed in excess of 40 knots per hour. These models are in each case accurately made to scale, including all the deck fittings, boats, rigging, etc. They were made by Austav Grahn of Brooklyn.

The annual report of the Oceanic Steamship Co. of San Francisco, shows that the net earnings during 1899 were $374,747.75, an increase of $49,190.05 over the preceding year. The amount in the treasury, $296,547.60 is an increase of $73,646.28. Of the authorized bond issue of $2,500,000, one-half has been issued at par, of which $725,534 was paid for the construction of three new vessels, the first of which is to go into service June 23, the second two months later and the third four months thereafter.

Capt. D. M. Cochrane has been appointed superintendent of the Goodrich Transportation Co., Chicago, to succeed the late Capt. Gillman. Capt. Cochrane has just left the steamer Atlanta and has been in the Goodrich line for several years.

NEW LAKE VESSELS VALUED AT $9,000,000.

It will be noted by reference to the table of vessels under construction in ship yards of the great lakes, which appears on another page, that their aggregate value is $8,902,000; combined capacity on 18 feet draught, 185,500 gross tons; horse power (of steamers), 45,950. Of the thirty-seven vessels in the list, twenty-three are orders in the hands of the American Ship Building Co., and most of these are freight steamers of 6,000 to 8,000 gross tons capacity, building for transportation companies representing Carnegie, Rockefeller and American Steel & Wire interests; all of them fitted with quadruple expansion engines of high power, and nine of them to have Babcock & Wilcox water tube boilers, this kind of machinery and steam power representing the highest practice in marine engineering.

A few notes contained in reports from the lake ship builders but for which there was no place in the table of new contracts may prove of interest. The Craig Ship Building Co. of Toledo, for instance, has in hand the work of putting into the wrecked steamer Harlem (a large vessel) an entire new bottom, to and including the tank top. The Union Dry Dock Co. of Buffalo is building four steel drill boats, valued at about $2,500 each, and of 50 feet length, 16 feet beam and 5 feet hold. Riebolt, Wolter & Co. of Sturgeon Bay, Wis., are building two wooden stone scows, each of 150 cords capacity and $8,000 value, for Farmenson & Jenson and the Geo. Pankratz Lumber Co., both of Sturgeon Bay.

At the works of Abram Smith & Son, Algonac, Mich., vessels under repair are the steamers St. Paul, Simon Langell and Italia, and schooners Aranac, Interlaken, Halloran, A. Smith, Theo. Voges and W. K. Moore. C. E. Bird of Saugatuck, Mich., is building a small wooden vessel of 45 feet length, to cost $1,600.

In addition to a passenger steamer reported in the lake table, the Polson Iron Works of Toronto has under construction four small composite steam vessels—34 to 56 feet length, and all designed by Mr. W. E. Redway, naval architect of Toronto.

J. P. Devney of Ashtabula, Ohio, has two tugs of medium size under construction at that point.

PROGRESS OF THE MORAN BROS. CO

That embodiment of energy characteristic of the Pacific coast has not been more strikingly illustrated than by the record made during the past few years by the Moran Bros. Co. of Seattle, Wash. A few years ago this firm was possessed of only a small ship yard fairly well equipped for the construction of wooden vessels. Gradually the works has been improved and its scope broadened until now this company is ready to undertake the heaviest boiler and machine work as well as contracts for almost any size of vessel in wood or steel.

The Moran Bros. Co. now has on the stocks the ferryboat King County, building for the commissioners of King county, Washington, for service on Lake Washington. This vessel is 126 feet in length, 32 feet beam, 48 feet breadth over all, 8½ feet depth and of 180 gross tons burden. She is fitted with two single, high-pressure engines, 14 inches diameter by 72 inches stroke, driving side paddle wheels 18 feet in diameter. Steam is supplied from one fire-box boiler, 60 inches in diameter and 20 feet long. The steam schooner G. W. Dickinson is building for the Alaskan freight and passenger service of the Pacific Clipper line. She is of wood, 210 feet in length, 39 feet beam molded, 17 feet depth and of 1,100 tons. She is equipped with a compound engine of 24 and 48 inches diameter and 33 inches stroke, to which steam is supplied from a Scotch boiler 14 feet in diameter by 10½ feet in length. Building for the same line is a four-masted sailing vessel, 206 feet in length, 42 feet beam, 16 feet depth and of 1,000 tons. A sea-going tug for the Pacific coast service of the Puget Sound Tug Boat Co. is of steel, 128 feet in length, 25 feet beam, 15 feet depth. She has a triple expansion engine with cylinders of 16, 24 and 40 inches, to which steam is supplied from two boilers of the Scotch type, each 11½ by 10 feet. A harbor tug building for Puget Sound service is 80 feet in length, 17½ feet beam and 9 feet depth, with a compound engine of 10 and 20 inches diameter and 16 inches stroke. There is one main boiler of Scotch type, 7½ feet in diameter by 9 feet in length.

Marine boilers are under construction as follows: For steamer Sarah M. Renton, Seattle, one boiler, cylindrical, 64 inches diameter and 16 feet long; for steamer City of Puebla, owned by Pacific Coast company, four main boilers, Scotch marine type, each 15 feet in diameter and 13 feet in length; for steamer Pomona, owned by Pacific Coast company, two main boilers, Scotch type, each 11½ feet in diameter and 11½ feet in length; also one donkey boiler for same vessel, Scotch type, 78 inches in diameter and 9½ feet long; for C. H. Callender, Astoria, Ore., one Scotch boiler, 90 inches in diameter, 9½ feet long; for steamer Cruiser, South Bend, Wash., one Scotch boiler, 72 inches in diameter and 9 feet in length.

Miscellaneous marine work under way includes machinery for steamer City of Grand Rapids, Seattle, Wash., consisting of two main engines of steeple compound type; machinery for steamer City of Puebla, consisting of changing and overhauling complete; machinery for steamer Pomona, consisting of changing and overhauling complete; water ballast tank for steamer Miami, consisting of deck and bulkheads and hatches for tank 40 by 50 feet and 10 feet deep.

It was the ambition of Orrin L. Jenks, whose death was announced from Port Huron, Mich., a few days ago, to see built up at that point, from the beginning that was made with a small ship yard and engine works, a large plant for the construction of steel vessels. He lived just long enough to witness a substantial beginning in this regard, as the Jenks Ship Building Co. will soon launch a very large steel freighter (6,000 gross tons capacity) and they have nearing completion another steel steamer of St. Lawrence canal dimensions. Mr. Jenks was highly spoken of by everybody who knew him. He was a native of Michigan and had been engaged in ship and engine building work at Port Huron for nearly forty years.

FAVORS A NEUTRAL CANAL.

The interview with Chairman T. E. Burton of the rivers and harbors committee of the house of representatives relative to the Nicaragua canal project that has attracted so much attention throughout the country, is as follows:

"I can hardly believe that congress will pass a bill for a Nicaraguan canal before the commission now investigating the subject shall have time to make its report. There is enough of question as to the best route to justify a more careful examination than has yet been made. The commission includes in its membership some of the best engineers in the country, both civil and military, and their recommendation, if unanimous, is bound to prevail. The question as to a selection of a route is not entirely one of engineering; negotiations must be conducted as to rights of way and probably with other nations having treaties with us, as the Clayton-Bulwer treaty, or countries having treaties with Nicaragua, providing that they shall have equal rights in any canal that shall be constructed, such as the treaties between Nicaragua and Spain, France and Great Britain. All these negotiations will require time, a much longer time than that required for the commission to complete its report. While this very important work should not be delayed, we have nothing to gain by hasty or inconsiderate action. An examination of the reports already presented shows that the details as to the Nicaraguan route are exceedingly incomplete.

"Personally I should prefer to see the canal constructed by private parties. This would avoid the danger of jobbery and would be in line with the view of many who dislike to see the government enlarge the scope of its undertakings. I fear, however, this will be impossible. One serious obstacle is that the countries through which the canal must be constructed could be dealt with more readily and favorably by our government than by a private corporation. Our policy should be for a neutral canal. Its construction should look to peace rather than to war. We are at the beginning of a new industrial era and no selfish or jingo policy will subserve our interests or be worthy of the position we ought to take among nations. The object of a canal is the expansion of our commerce and the sale of our products rather than the securing of a fortified waterway through which our warships may go. A mere paper convention, giving us exclusive rights, would not in case of conflict be effective unless we were possessed of a superior force. We are now asking for an assurance from foreign powers for an open door in China, where they have fortresses, military and naval forces and spheres of influence. Is it quite consistent for us to ask assurance of equality from them there, yet seek exclusive rights in so important a channel as that which will connect the two great oceans?"

TUG RICHARD CROKER, BUILT BY GAS ENGINE AND POWER CO. AND CHAS. L. SEABURY & CO., CONSOLIDATED, MORRIS HEIGHT, NEW YORK CITY.

TOWNSEND & DOWNEY'S PLANS.

It is quite evident that the incorporation of the business of Townsend & Downey, who have been for many years engaged in shipwright business in New York (Produce Exchange building) means a marked enlargement of their operations. As announced when they proposed to undertake naval work recently, they have purchased a large water front property in New York harbor, where they are now constructing a ship yard and equipping it with modern tools and machinery, for the building and repairing of both iron and wooden vessels of all kinds. They are building a marine railway of 4,500 tons capacity, probably the largest in the world, and will have two other dry docks at their yard. This firm has been lately awarded a contract from the United States government to build and equip a steam dredge for Sabine Pass, Texas, and have under construction a large pleasure craft for New London parties.

The first engine to be constructed in the new shops of the Superior Ship Building Co., Superior, Wis., of which D. E. Ford is manager, will be for the steamer of St. Lawrence canal dimensions that the Union Dry Dock Co. of Buffalo is to build for J. F. Crosthwaite and others. The steamer is to be 258 feet over all, 40 feet beam and 18¼ feet depth, and the engines will be triple expansion of 20, 33 and 54 inches cylinder diameters, and a common stroke of 40 inches. There will be a surface condenser, and air pumps will be attached with independent circulating pumps. The boilers, to be built at the Cleveland works of the American Ship Building Co., will be 12½ x 12½ feet, allowed 170 pounds of steam.

A very clear chart in colors, just issued by Peter Wright & Sons of Philadelphia, operating the Red Star tug line, gives anchorage regulations for the port of Philadelphia as adopted by the board of wardens of that port.

UNITED STATES BATTLESHIP MAINE.

(Subject of special colored supplement in this issue.)

The act of Congress authorizing the building of the battleship Maine was approved May 4, 1898, and the contract was executed Oct. 1, 1898. The keel of this, the second vessel of that name, was laid with appropriate ceremonies at the works of the Messrs. Cramp & Sons, Philadelphia, Feb. 15, 1899, on the anniversary of the blowing up of the first Maine in the harbor of Havana. The contract price for the hull and machinery alone is $2,885,000, and the date of completion June 1, 1901. The actual date of completion, however, will be governed entirely by the time of delivery of the armor at the ship yard, the matter of armor being one of the uncertain elements. The vessel was based on the navy department's design as approved for a 16-knot vessel; 20 feet were, however, added to her length by the contractors, to accord with the department's later decision, in order to accommodate the increased power for 18 knots speed.

Length on load water line	388 feet
Breadth, extreme	72 feet 2½ inches
Displacement at trial draft of 23½ feet	12,500 tons
Freeboard, forward at the bow	20 feet
Freeboard aft at the stern	13 feet
Height of axis of forward 12-inch turret guns above water	26½ feet
Height of axis of after 12-inch turret guns above water	19 feet
Height of axis of main deck 6-inch R. F. broadside guns	15¼ feet
Height of axis of upper deck 6-inch R. F. broadside guns	23¾ feet
Height of axis of machine guns in lower tops above water	60 feet
Height of axis of machine guns in upper tops above water	76 feet
Height of sight holes in conning tower above water	34½ feet

The main battery will consist of four 12-inch breech-loading rifled guns, and sixteen 6-inch rapid-fire guns; the 12-inch to be installed in two Hichborn balanced turrets, 11 inches thick, located on the centre line and mounted in circular barbettes 12 inches thick, extending down to the protective deck. Twelve of the 6-inch guns are mounted in broadside on the main deck, two of which can also fire directly ahead. The remaining four 6-inch guns are mounted on the upper deck amidships on each side, two being able to fire directly ahead and two directly astern as well as on broadside. The secondary battery consists of twenty 6-pounders, six 1-pounders and four Gatlings, with one 3-inch rapid-fire field gun. The 6-pounders and other secondary battery guns will be located on the after berth deck, upper deck, bridges, and in the military tops. There is a strong probability of eventually substituting 14-pounders for some of the 6-pounders mentioned, these later guns being of a new and very effective design. There are also two submerged torpedo tubes, one on each side below the protective deck, forward of the forward turret. The Maine will carry eight 17-foot torpedoes. They are the first underwater torpedoes introduced into the United States navy, though they are being used very generally in all battleships building abroad. The 6-inch and 12-inch guns will be in lengths of not less than 40 caliber, with a muzzle velocity of not less than 3,000 feet per second for the 12-inch, they being more effective than the present 13-inch guns, and thus saving a considerable weight in guns, mounts and ammunition. Smokeless powder is to be used.

The water line belt will be in depth 7½ feet, that is extending from 4 feet below the water line to 3½ feet above it, and from the stem to abreast the after side of the after barbette. The maximum thickness will be 11 inches, tapering from that thickness at 1 foot below the water line to 7½ inches thick at the lower edge. It will also taper from the maximum thickness abreast the forward turret to 4 inches thick at the stem. Protection to the after end of the vessel is provided by a heavy protective deck made of 120-pound plates. The casemate armor protecting all the 6-inch guns will be 6 inches thick. There are also splinter bulkheads, in thickness 1½ inches, located between the guns to localize any damage in action. The conning tower and shield are each 10 inches thick, with an armored tube 7 inches thick extending below to the protective deck. The signal tower is cylindrical in shape, 6 inches thick, and located forward of the after turret. The protective deck will extend for the entire length of the vessel, the outer edge being 4 feet below the water line. The lower course will be of 40-pound plates; the upper course on the flats 62½ pounds, and on the slopes 70 pounds, with 120-pound plates aft over the steering gear. Protection is further assured by a cofferdam worked entirely around the vessel in the neighborhood of the water line, in which will be packed between 40 and 50 tons of corn-pith cellulose.

OTHER FEATURES OF DESIGN.

A double bottom, built of ⅜-inch inner bottom plates, will be worked the whole length of the machinery space and also under the magazines forward and aft. This space will be subdivided into numerous watertight compartments, in order to localize any injury that may occur to the bottom of the vessel. These compartments will be connected by means of pipes with the drainage and pumping systems of the vessel, so that water may be carried in these spaces for trimming purposes, or pumped out as required. Large and small, there are about 400 compartments, mostly water-tight, throughout the vessel. In addition to the protection given by the armor and cofferdams, the boilers and engines are surrounded by a deep body of coal, the coal bunker capacity being fully 2,000 tons, an unusually large quantity in a vessel of this size.

The Maine will carry, exclusive of two punts and balsas, fourteen boats, which will be handled by four powerful steam cranes. These boats will stow amidships on the bridges, and out of the range of the guns. Two of these boats are steam cutters, one being 40 feet in length and the other 36 feet. There will be four steam winches located on the decks, fitted for manipulating the wire cables, hoisting coal, and for general deck purposes. The motive power for the steering arrangement will be steam, located well down below the protective deck. Two one-ton ice machines will be installed on the berth deck, thus ensuring ample provision for the preservation of fresh meats and other perishable provisions for the entire ship's complement. Large refrigerating rooms are built for this purpose. Unusual care has been taken to provide rooms with berths for the petty officers and machinists, also ample washrooms for the firemen, with shower baths and closets for all these men, and the remainder of the crew.

The officers' quarters will be as large as practicable, and the woodwork will be electric fireproofed; the bulkheads being of metal generally, or coated where otherwise required with non-combustible material. Accommodations will be provided for one admiral, one captain, sixteen wardroom officers, twelve junior officers, seven warrant officers, twelve machinists, and seventeen petty officers. Eight electricians will also form part of the complement, together with thirty-two firemen, sixty marines and 418 for crew, making a total complement of 584.

The military masts, as well as their tops, will be built entirely of steel, but fitted with the usual wood topmast and yards for signalling purposes. A commodious chart house will be built, extending over the conning tower and fitted with chart table, transom, seats, lockers, etc., as usual, together with steering arrangement, tell-tales, telegraphs, speaking tubes, etc. A machine shop, fitted up with small lathes, drills, etc., will be provided for such light machine work repairs as is possible to do on shipboard. The ventilation will be very elaborate and complete, so as to render all rooms and quarters habitable at all times. The turrets, as well as many of the auxiliaries, will be operated by electric power, and the vessel will be lighted throughout by this means. Powerful electric search lights will be placed on each mast and on top of the chart house.

The motive power consists of triple expansion twin screw propeller engines, with Niclausse water-tube boilers to indicate about 16,000 horse power, with assisted draft. The engines are vertical three-cylinder of a collective power of about 8,000 horses each. The working pressure in the boilers will be about 256 pounds per square inch, and 200 pounds per inch at the engines. The boilers are placed in water-tight compartments separated by middle line bulkhead. The diameter of the high pressure cylinder is 38½ inches, that of the intermediate cylinder 59 inches, and the diameter of the low pressure cylinder 92 inches, length of stroke of all pistons 42 inches, and the number of revolutions on trial to be about 126 per minute. The screw propellers are to be three bladed, made of bronze and about 14½ feet in diameter. The boilers are twenty-four in number, arranged in three groups. The total amount of heating surface will be about 58,104 square feet and the grate surface about 1,353 square feet. The smoke pipes will be three in number, and in height about 90 feet above the level of the grates. A speed of at least 18 knots is expected with the power stated above, and with forced draft somewhat above that figure is anticipated. Forgings are of Bethlehem Co. manufacture.

"LONG-ARM" SYSTEM AND SAFETY DOOR.

It stands to reason that the best possible life-saving device in cases of collision or skin puncture from shell, torpedo or grounding is the ship herself—made nonsinkable. Boats, balsas, life preservers, etc., are simply auxiliaries and make-shifts after the ship fails in her floating powers. It is claimed, therefore, that in this respect the Maine, from the fact that the government has embodied in her the "Long-Arm," central-station system of power operation for all the principal water-tight doors and armored hatches, will be superior to any ship now afloat. The equipment will include the "Long-Arm," safety power door, with individual control at each door and hatch fully maintained during "emergency closing" as well as at all other times.

Hitherto, nonsinkability has been sought (in the only way) through a very expensive subdivision of the hull by bulkheads. Door-ways are absolutely necessary in these bulkheads for efficiency in working the ship. These door-ways are the "weakest links in the chain," and unless they can be closed with certainty and promptness, without injury to or imprisonment of the working force and without prohibiting necessary intercommunication for working the ship, this expensive insurance by bulkheads becomes utterly void. It has taken a number of awful marine disasters to first-class ships as well as hundreds of smaller mishaps, to prove to seagoers and the general public that their time-honored confidence in this bulkhead insurance, with ordinary doors, is a delusion and a snare, and so it is claimed that the "Long-Arm" system and safety door is the first and only practicable scheme so far devised for perfecting the stability structure and preserving the emergency flotation of ships. The aims of this system are:

First. To construct all the principal doors and hatches in such a manner that they cannot foul or jam (the ordinary door is unfit for power-working), and so that at all times each door and hatch may be operated on the spot, by central-station power, automatically tightening on the seat by the last act of closing and automatically releasing by the first act of opening.

Second. To place such central-station power under direct control from an "emergency station" on the bridge, so that all doors and hatches may be closed quickly at any moment by the person first cognizant of danger, and so that such "emergency closing" shall leave absolute control in the hands of the man at the door for his own safety and his own duties.

Third. To simplify and standardize the present endless variation in type, size of openings and fittings, reducing the same to certain well considered sizes, of standard type and interchangeable parts, thus placing this important item in ship-fittings on the same plane with similar standardization in modern railway equipment, and gaining the attendant advantages.

The "Long-Arm" installation on the Maine includes twenty-four doors and ten armored hatches, with a pneumatic central station (electrically driven air compressor, storage flasks and regulating valves) and two "emergency stations." The pipe line connecting to each door and hatch is of 1 inch to ⅜ inch pipe with ⅛ inch branches. For the working pressure 150 pounds is used and 300 pounds for the emergency pressure. The air is "kept on tap" in sufficient volume at the central station under 1000 pounds pressure, the compressor being regulated by the receiver pressure, using a 2-H. P. current occasionally and operating only as a "make-up."

WHERE THE NEW MAINE IS BUILDING.

THE CRAMP SHIP YARD—IMPORTANT IMPROVEMENTS AT THE PHILADELPHIA WORKS.

In view of the prominence of the Wm. Cramp & Sons Co. in the ship building industry of America, it is peculiarly fitting that "the new Maine" should be built at the ship yard of that company. In no other vessel of the American navy will popular interest be so great as in this magnificent battleship, which it is proposed to launch at the next anniversary of the day which sealed the fate of its predecessor of the same name. More naval vessels have been turned out from the works of the Cramps than from any other ship yard on this side of the Atlantic, and from this institution also came the first great steamers of the fleet that is to restore the American flag to its place among merchant navies.

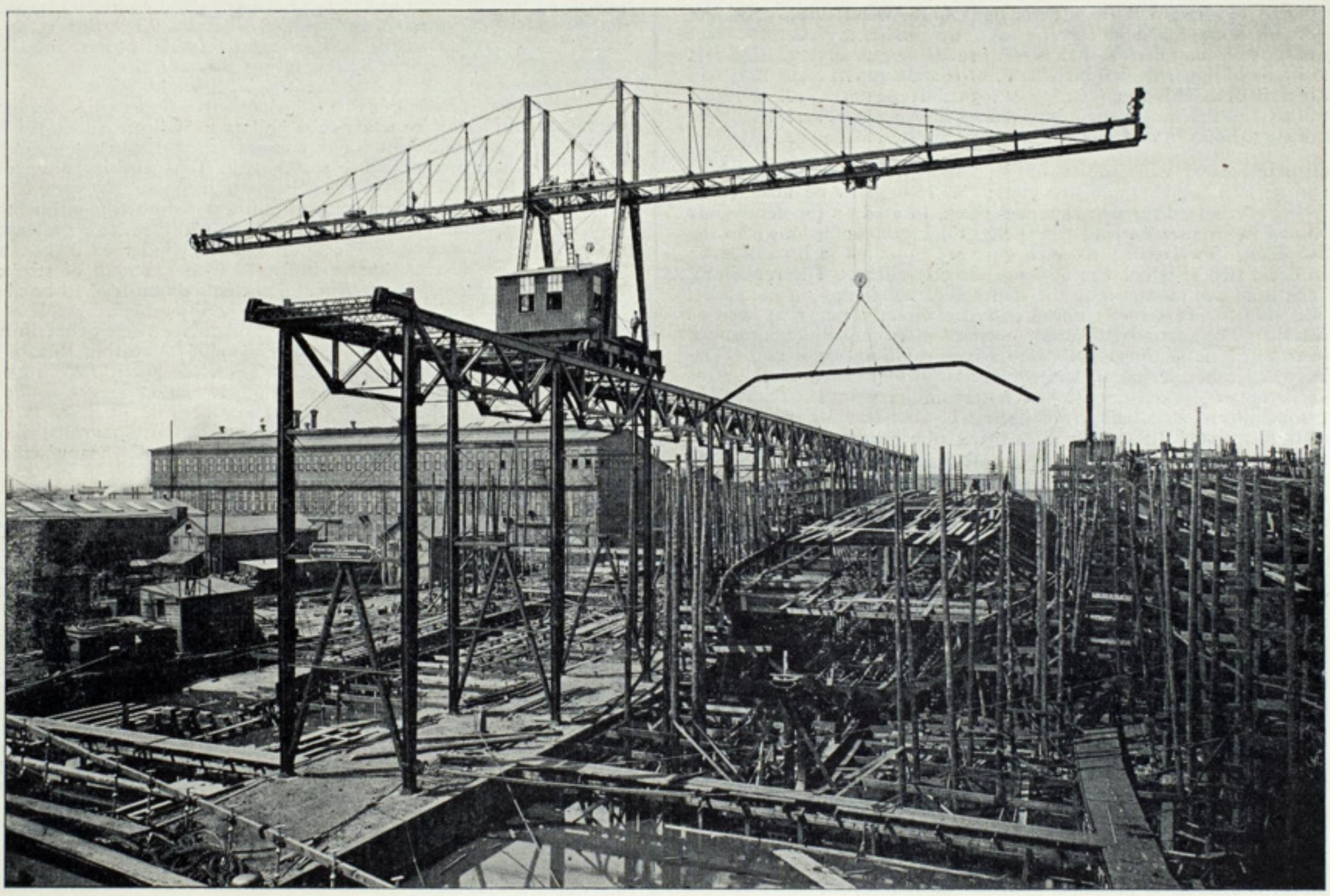
Ship building has been one of the most important of Philadelphia's industries ever since the establishment of the city. Penn himself, it is recorded, took steps looking to the encouragement of ship building soon after he reached his new home. In the years from 1780 to 1790 more than 160 ships were built in the Quaker City, and from that time forward Philadelphia easily held her supremacy in the ship building world. In the closing decade of the last century steam navigation in Philadelphia was inaugurated by the building of the John Fitch, the first American steamship, and which made regular trips between Philadelphia and Trenton. During the period of depression which followed the war of 1812 the ship yards of Philadelphia constructed an immense amount of tonnage for foreign owners. This embraced both merchant vessels and men-of-war, including one line-of-battleship, which was sold to Emperor Nicholas of Russia. It will thus be seen that the Czar became even at that early date a patron of the American ship yard, and twice since then have the Russian officials placed with the Cramps large orders for vessels. In 1830 two American-built vessels were sold to the English East India Co., and it is interesting to note, in the light of the present reversal of the conditions, that at the time noted a great outcry was raised in England over the circumstance and the British board of trade took action, which effectually closed the market to American-built vessels.

What might be termed the modern epoch of ship building in Philadelphia was inaugurated about 1830, and throughout the entire period since that time the Cramps have been most prominent figures. Indeed with the transition from canvas to steam and from wood to iron the old ship yards which had once been Philadelphia's mainstay succumbed one by one, until William Cramp and his sons finally found that the task of perpetuating the ship building supremacy of Philadelphia in the new era practically devolved upon them.

ESTABLISHED SEVENTY YEARS AGO.

The institution of which the present William Cramp & Sons Ship & Engine Building Co. is the outgrowth was established in 1830 by William Cramp, who was then twenty-three years of age. The old yard, to which, by the way, no engine building plant was attached, turned out many vessels, both sail and steam, for American and foreign merchant marine and for the navies of the United States and Venezuela. Along in the early 70s about half of the water front of the present yard was purchased and the concern was changed to its present corporate form. The old yard was at the same time transformed into a basin dry dock with a marine railway as an adjunct. The growth during the next score of years is well indicated by the fact that the capital of the company was increased from one to five million dollars. In 1879 occurred the death of William Cramp and his eldest son, Charles H. Cramp, was chosen to succeed him.

There have been built at the Cramp yard since its establishment over three hundred ships, including more than two dozen war vessels for the United States navy, four cruisers and a battleship for the Russian navy, one cruiser for the Japanese navy, a gunboat for Venezuela and a countless array of freight and passenger steamers for both coast and transatlantic service, as well as yachts and tugs. From a total of one hundred employes the plant has been expanded until almost six thousand men are now regularly employed. The Cramps have certainly been pioneers in their operations. They built the Indiana and Massachusetts, two of the first three battleships in the American navy. The battleship Iowa, which was a distinctive departure in its way, came from their yard. Likewise did



ELECTRIC TRAVELING CANTILEVER CRANE CONSTRUCTED AT THE CRAMP SHIP YARD BY THE BROWN HOISTING AND CONVEYING MACHINE CO., OF CLEVELAND.

the armored cruisers New York and Brooklyn and the protected cruisers Columbia and Minneapolis, each of which indicated in its construction a new trend of development. Too much cannot be said of the significance of the construction of the St. Louis and St. Paul, the American liners which constituted the first Atlantic express steamers built in accordance with the provisions of the postal subsidy act. The company also built the Pennsylvania, Ohio, Indiana and Illinois for the same line; the Essex, Allegheny and Berkshire for the Merchants' & Miners' Transportation Co.; the Venezuela, Caracas, Philadelphia and Valencia for the Red D Line; the Cherokee, Seminole, Iroquois and Algonquin for the Clyde line; the Olivette and Mascotte for the Plant line, and a host of others. Probably more ships of Cramp construction were to be found in the auxiliary navy during the recent war with Spain than could have been listed to the credit of any two or three other plants combined. The Cramp company fitted the steamer George W. Clyde with the first compound engine built in America. They fitted the steam yacht Peerless with the first triple expansion engine constructed in this country, and finally to their credit stands the Samson, the first steam tug built in America.

Of late years this company has been none the less progressive. Probably the most notable recent products of the yard are the battleship Alabama, which has just reached the stage of completion, and the cruiser Kasagi, which was completed last year for the Japanese government. The Czar of Russia was so highly pleased with the cruisers Asia, Africa, Europe and Zabiaca, which the Cramps built for the Russian navy in 1879 and 1880, that they secured last year an award for a battleship and cruiser of the largest type for the Russian government. These vessels are now under construction. Other work in hand at the present time includes the new Maine; three 6,000-ton passenger and freight steamers for service on the Pacific; two steamers for the Cuba Mail Steamship Co. and two

12,000 ton steamers for the International Navigation Co., which will be, when completed, the largest vessels ever constructed on this side of the Atlantic.

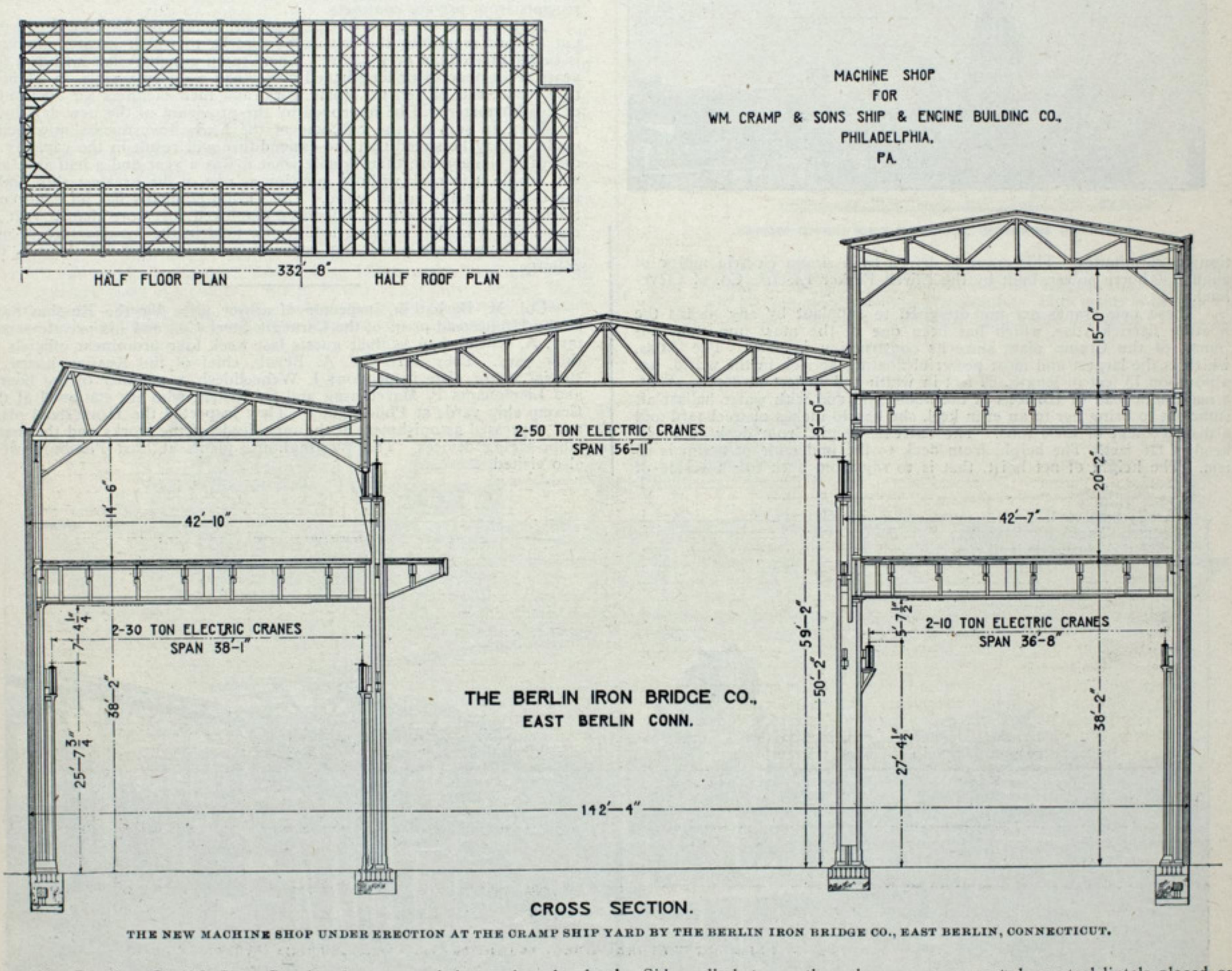
A SUMMARY OF IMPROVEMENTS.

For some months past extensive improvements have been in contemplation at the Cramp yard, and the work of providing these is now well under way. It has been felt for a long time that the building 1164 feet in length wherein are included under one roof the joiner and pattern shops, machine and erecting shops, ship shed, two mold lofts, bending shed, etc., was inadequate to the requirements imposed upon it, and the boiler shop and the foundry—the latter one of the largest in the United States—have frequently been taxed to their utmost capacity. The old yard covered little more than thirty acres, but with extensions recently made the works will embrace more than forty-five acres. This new territory is being utilized primarily for a new 700-foot building slip, a new dry dock 750 or 800 feet in length, and a site for a machine shop, which will be thoroughly modern in every way, and of which more is said later in this article. It is even hoped that within a short time a second additional ship way can be constructed at the southern end of the yard, thus making a total of eight, each with a launching depth of from 30 to 35 feet at the way-ends at high water.

A pier which comprised a portion of property recently purchased from the Reading Coal & Iron Co., has been extended to a length of 1,120 feet and another pier at the other end of the yard has been built on similar lines, thus enlarging very much the capacity of the fitting out docks. Twenty dwelling houses, which occupied a portion of the property recently purchased, have been torn down to provide a site for a new blacksmith shop, and twenty-five additional dwellings were displaced in order to afford a site for a new power house, from which will be supplied electrical current for both power and lighting purposes. Pumps of various kinds, including those for fire protection and the air compressors supplying pneumatic tools, will also occupy this building. In this connection it may be noted also that the equipment of pneumatic appliances recently installed at the Cramp yard has no superior anywhere in the world. It is eventually intended to displace almost all the engines in use throughout the works by motors. In the southern end of the yard will be erected shops for punches, shears and rolls.

The new machine shop, which will be in a way the pride of the rehabilitated plant, was built by the Berlin Iron Bride Co. of East Berlin, Conn., and is now in course of erection under the supervision of its engineers. This building is situated on the corner of Norris and Richmond streets. It has an end frontage on Richmond street of about 143 feet and a length on Norris street of about 335 feet. The building is of steel skeleton framework construction, with brick outside filling walls between the main supporting columns. As shown in the cross section herewith presented, the building has a main central traveling crane runway, served by two 50-ton electric cranes, with a span of about 57 feet center to center of supporting girders. On either side of this main central portion are machine shop galleries about 42 feet wide. The wing adjoining Norris street is three stories high, while the opposite wing is two stories high. The floor space in the lower story of both wings is served by electric traveling cranes. On the third story side, runways are designed for two 10-ton electric cranes, while on the opposite, or second story side, are two 30-ton electric cranes. The height from the first floor to the top of the second floor is 38 feet 2 inches, while the clear height in each of the upper stories is 15 feet. The gallery floors are supported by clear span plate girders, spaced 24 feet apart, between which are rolled steel beams carrying heavy plank floors with maple top dressing.

The floor load in the second story is 400 pounds per square foot, while the third floor is designed for a load of 350 pounds per square foot. Roofs are supported by clear span trusses spaced 8 feet apart, carrying matched plank, which is to be covered with slag roofing. The trusses over the wings are arranged with trolley tracks extending lengthwise of the building, having a capacity for 4,000 pounds, trolleys and hoists. Foundations for the building are concrete piers extending to rock, in some cases a distance of 16 feet below the base of the main columns of the building.



CROSS SECTION.

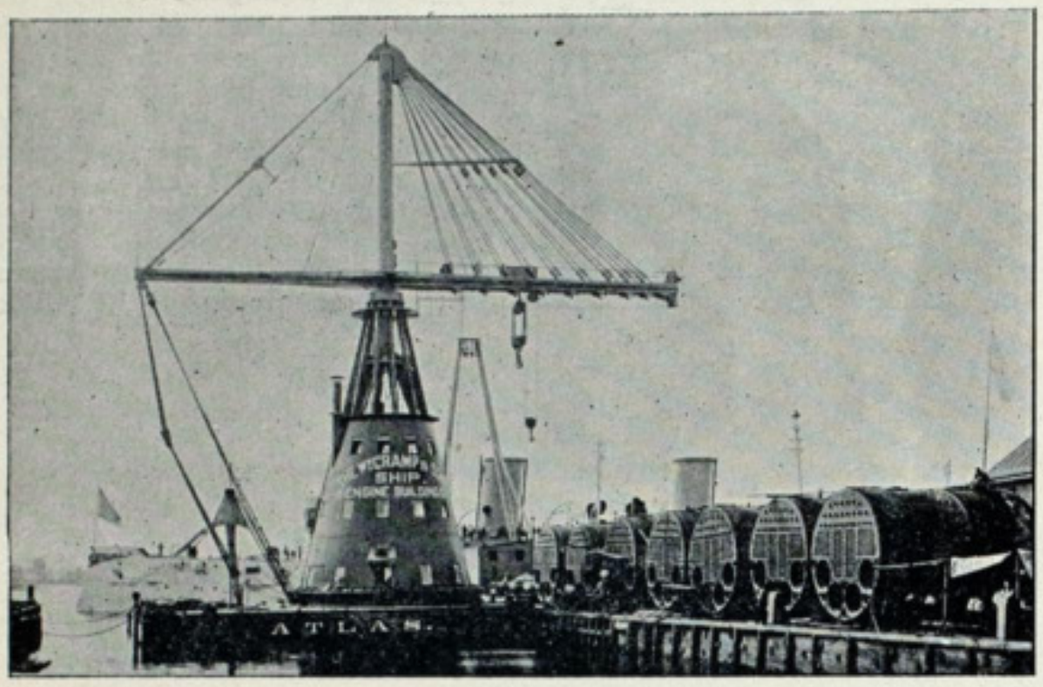
THE NEW MACHINE SHOP UNDER ERECTION AT THE CRAMP SHIP YARD BY THE BERLIN IRON BRIDGE CO., EAST BERLIN, CONNECTICUT.

Side walls between the columns are supported on steel lintels placed on top of the foundation piers, and also between the columns at each floor level. In the side and end walls between the columns are windows of maximum size for lighting the interior of the building. Light is also obtained in the second story wing by a continuous glass skylight on the outside slope of the roof trusses and the center crane bay, while the third story on Norris street is lighted by clear stories above the adjoining roofs. Entrance to the building is obtained by three large doors in each end.

ELECTRIC TRAVELING CRANES.

An important place among improvements at the Cramp works must be accorded to the three electric traveling cantilever cranes installed by the Brown Hoisting & Conveying Machine Co. of Cleveland. The first of these cranes to be completed, and which, like the others, is mounted on a steel trestle also constructed by the Brown company, is denominated the "battleship crane," by reason of the fact that it is located between the ways occupied by the United States battleship Maine and the Russian battleship Retvizian—the latter the largest man-of-war ever constructed in America. This crane will, by reason of its location, be employed continuously in carrying material to battleships under construction. The two other cranes, one of which is not yet completed, are termed the "cruiser" and "merchant ship" cranes. The three cranes vary only in detail. The battleship crane has a track that measures 547 feet.

The cantilever is 202 feet and the maximum load of 12½ tons can be carried 60 feet on either side of the center line of the trestle. From the lower chord of the cantilever to the ground is 92½ feet. The track of the cruiser crane is 582 feet in length; the cantilever is 143 feet in length and the distance from the ground is 85 feet. The merchant crane is 95 feet in height and 664 feet in length and has a cantilever 168 feet in length, upon which a load of 10 tons can be carried 46 feet each side of the center and of 3 tons 78 feet each side. The efficiency of the battleship crane could not have been more effectually demonstrated than by the handling of the stern post of the Russian battleship. This stern post, which weighs almost 14 tons, was carried the entire length of the ways and set in position in 21 minutes. This crane is driven by a single electric motor of about 150 horse power, built by the Elwell Parker Electric Co. of Cleveland.



FLOATING DERRICK ATLAS AT THE CRAMP WORKS.

These new cranes are not designed to supplant by any means the floating derrick Atlas, which has been one of the most important adjuncts of the Cramp plant since its construction in 1892. The Atlas, which is the largest and most powerful floating derrick in the world, has a pontoon 73 feet in length, 62 feet in width and 13 feet in depth. With a maximum load of 125 tons at the boom end and with water ballast aft sufficient to bring her to an even keel, she has 16 inches of freeboard and a displacement of 1,563 tons. The extreme height from deck to masthead is 116 feet. The height from deck to the underside of boom is 65 feet. The height of net hoist, that is to say from deck to underside of hook, with 30 inches of block clearance, is 50 feet. The diameter of the cone at the base is 40 feet; the length of boom from axis of cone to center of main hook when at the boom end 58½ feet; swing of boom clear of pontoon 36 feet. Draught of water when ballasted to an even keel with maximum load at boom end is 12 feet. One of the most creditable performances in the record of the Atlas was the handling of an 80-ton boiler for the cruiser Minneapolis from the boiler wharf to the hold of the vessel, a distance of over 100 feet, in 27 minutes from the time of hooking onto the slings. On another occasion all four of the Indiana's main boilers, each weighing 72 tons, were taken from the wharf and put in place in an elapsed period of 4 hours and 20 minutes. The pontoon of the Atlas is of iron, while the boom, mast, braces, collar, helmet and all lifting and traversing gear are of steel. For weights up to 50 tons the boom swings independent of the pontoon, while for weights above 50 tons the boom is stiffened by two steel backstays and turns with the pontoon.

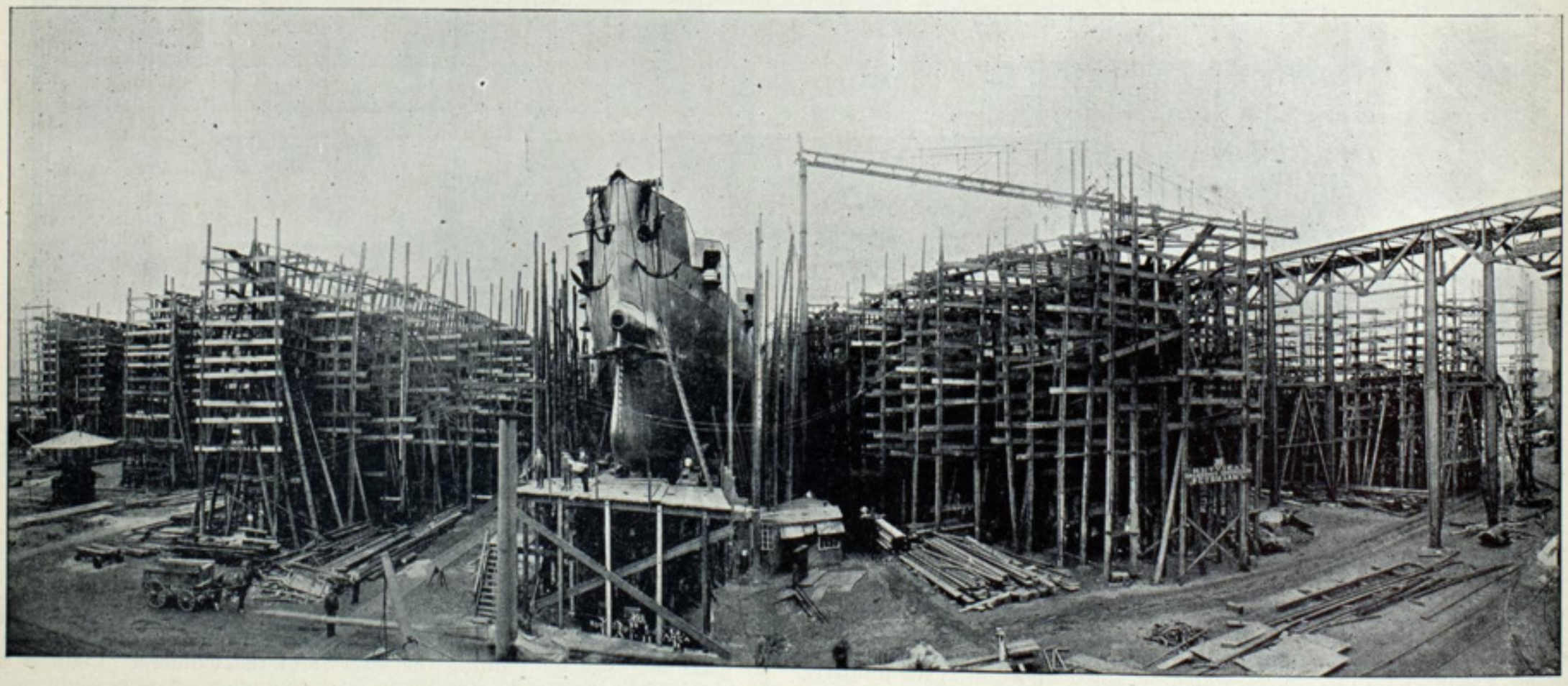
In the mapping out of improvements here referred to, particular attention has been given to a system for transporting material to all parts of the yard. It must not be inferred from this that the equipment heretofore afforded in this regard has been entirely inadequate, for the yard has been connected with the Pennsylvania, Reading and Belt lines of road. Now, however, it is proposed to extend this system of tracks, sidings and switches throughout all the various departments.

RECORD OF THE CRAMP COMPANY.

The record of the Cramp company is certainly one that constitutes a strong tribute to American industrial enterprise. The Philadelphia plant, when the improvements now under way are completed, will represent an investment of more than $7,000,000 and will give employment to a small army of men who draw in wages each week something like $50,000. As has been stated, the company has built during the seventy years of its history more than three hundred vessels and upwards of two hundred marine engines. In modern vessels of its navy, the United States has expended at the Cramp yard in recent years $25,250,000 and when the payments have been made on the Alabama, the Maine and the Russian war vessels now under construction the total will be brought up to more than $38,000,000, which, it will be understood, is entirely apart from the receipts from private contracts.

A resume of the work of this company would not be complete without a word regarding the repairs of vessels, to which greater attention is being given than ever before. The Cramp company has within a few years reconstructed or lengthened more than a dozen vessels, in addition to a heavy run of general repair work, and their facilities for operations of this character will be improved by the provision of the new dry dock. In short, to sum up the outcome of the heavy investments now being made, it may be stated that the expenditure will result in the capacity of the yard being more than double what it was a year and a half ago, and will enable it to rank without question as one of the greatest ship building establishments in the world. The Cramp company has on hand contracts sufficient to keep its full force employed for more than a year to come, and it is also working into a new field in the manufacture of machinery of immense power and capacity for the mining industries of the country.

Col. M. Barhatkin, inspector of armor plate for the Russian navy at the Homestead plant of the Carnegie Steel Co., and his private secretary, A. Knaap, had as their guests last week four prominent officials of their navy. They were Col. A. Brynk, chief of the Russian board of special armor plate inspection; J. Wencelidesh, a member of the board, and Lieutenants P. Macedinsug and O. Risher, who are stationed at the Cramp ship yards at Philadelphia. They inspected the Homestead plant and expressed astonishment at the magnitude of the works and the many labor-saving devices. The Westinghouse plants at East Pittsburg were also visited.



SCENE AT THE CRAMP SHIP YARD, SHOWING THE RUSSIAN CRUISER AND BATTLESHIP, AND THE NEW MAINE UNDER CONSTRUCTION.

The final builders' trial of the torpedo boat Goldsborough, building by the Wolff & Zwicker Iron Works, Portland, Ore., took place in the Columbia river a few days since. It was first expected that several additional preliminary tests would be necessary, but the showing made on this trip was so favorable that the builders decided to dispense with any further trials. The machinery worked in a most perfect manner. The vessel started with 250 pounds steam pressure and for a time made 405 revolutions. This is 45 revolutions more than is required to give a speed of 30 knots. The speed ranged from 24 to 30½ knots. It is expected that the official trial will take place on Puget Sound within ten days.

W. Irving Adams of East Boothby, Me., has constructed during the past year four small sailing vessels, but at present has nothing on hand but repair work.

NEW LIGHT-HOUSE TENDERS.

DESCRIPTION OF THE HEATHER, TO BE BUILT AT ONCE FOR OREGON COAST SERVICE.

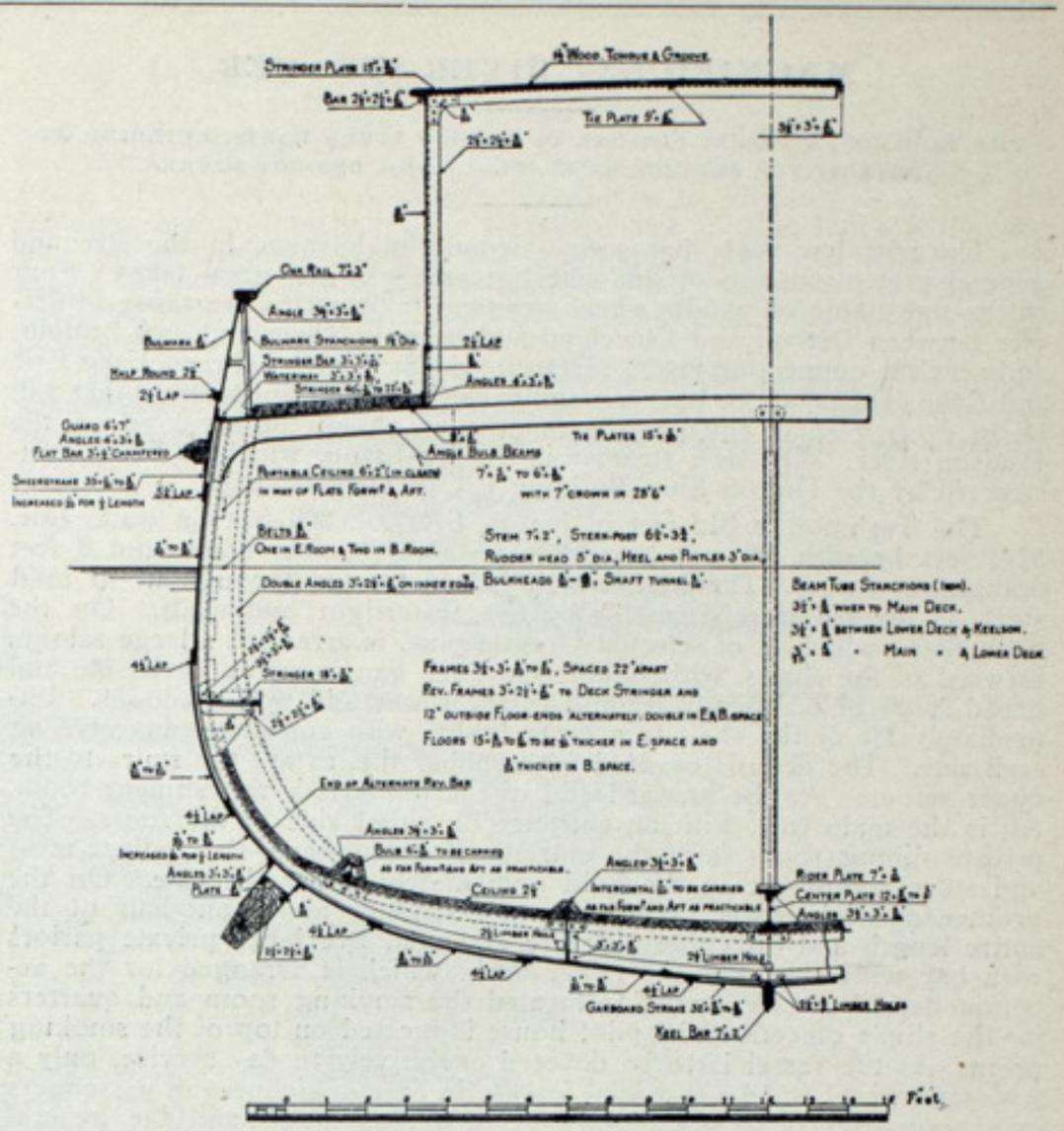
WASHINGTON BUREAU, MARINE REVIEW, 1345 PENNSYLVANIA AVENUE, WASHINGTON, D. C., FEBRUARY 7, 1900.

Bids have been solicited by the light-house board for construction of the Heather, a large, sea-going, steam light-house tender, destined for service in the thirteenth district on the Oregon coast. The length of this ship will be 178 feet 6 inches, beam 28 feet 6 inches and depth of hold 15 feet. The vessel will be built entirely of steel and everything about her will be of American manufacture. She will have five main bulkheads, watertight, making six main watertight compartments. The two end-most compartments will be divided by trimming tanks. The coal bunkers are 38 feet in length and are in themselves watertight. The ship may, therefore, be said to have in effect ten watertight compartments—six main and four subdivisions. The Heather is fitted with big, fresh water tanks, sufficient not only to supply drinking water on the voyage to Alaska but to replenish the boilers as well. She has a Globe steam steerer (Cleveland make) and an automatic towing machine, designed to relieve the strain in periods of stress on any consort she may have. She has a patent windlass and carries an electric plant for lighting purposes. The vessel has a big forward deck for buoy work. A deck house extends two-thirds of the ship's length and is built entirely of steel and riveted down to the deck beams to secure solidity. There is not a particle of wood work about the exterior of this deck house. It is constructed to withstand a solid 20-foot sea over the stern. In fact a vessel of unusually staunch construction is necessary to cross the Columbia river bar where the surf is one of the most vicious along the coasts. Vessels are frequently submerged in this locality with solid seas running over their sterns.

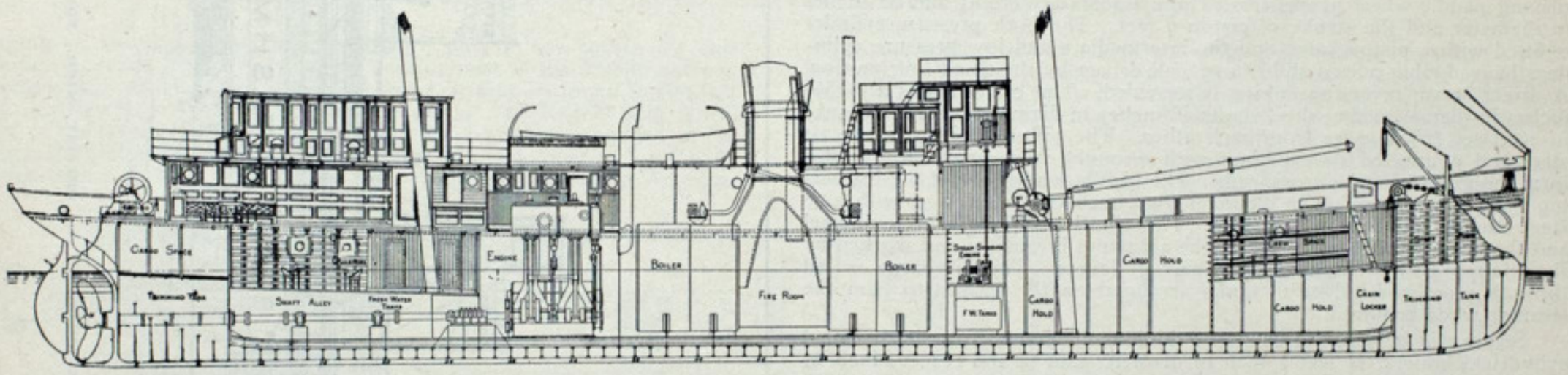
In the deck house are the inspector's quarters, chief engineer's room, dining room and galley. Below the main deck aft are the staterooms for officers of ship and mess room; below the main deck forward are the crew's quarters, with separate apartments for seamen and firemen. The pilot house and master's room are on top of the main deck, and in the deck house aft is the chart room and office for inspector. The Heather is rigged as a two-masted schooner without square rig, and is fitted with derrick and modern apparatus for hoisting buoys and chains and doing the necessary work of a tender. She is, however, not only a tender, but is fitted out as a supply ship, having abundant room for storage. Outside of quarters for light-house inspector there is room for twenty-five men with allowance for extra lamp men and mechanics. In addition there is a saloon and three staterooms with sleeping arrangements for seven persons.

The engine will be of the compound, open-front, surface-condensing type, with cylinders of 23 and 43 and a stroke of 30 inches. She has two Scotch boilers 12.6 feet in diameter and 12 feet in length. The condenser has a cooling surface of 1,650 square feet. The estimate of horse power is 700 under economical running. The ship will have a steam reversing gear and a single propeller which will be about 9.6 feet in diameter. A water service pump will furnish a constant flow to bath rooms, wash room and water closet. Tub and needle baths will be provided for all hands. A steam ash ejector is another feature of the equipment. The piping will be all of copper and the pipe and boiler covering will be of best quality magnesia. There will also be provided a donkey boiler of sufficient capacity to heat the vessel and run the sanitary pump. A steam hoisting engine will also be installed. Walfrid Sylven, engineer for the light-house service, is the designer.

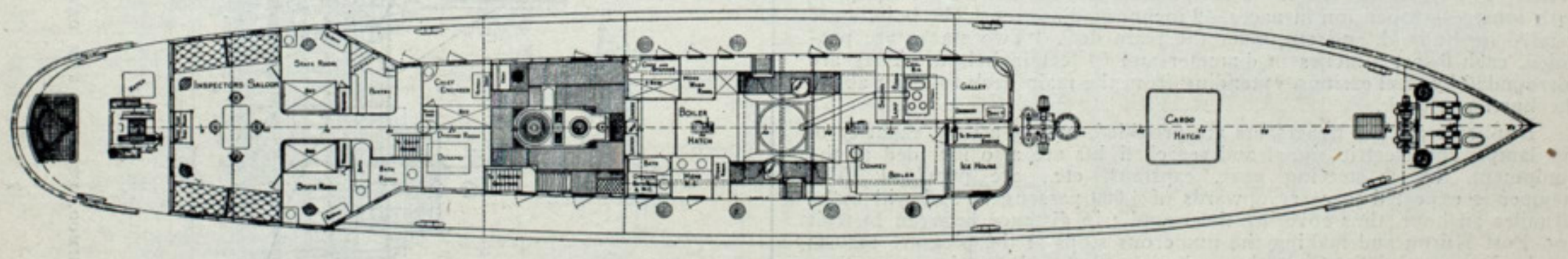
Specifications are now in the hands of the printers for light-ship No. 74, designed for the Massachusetts coast, and bids for its construction will be solicited shortly. It is expected that light-ship No. 72, which is now building at the works of the Fore River Engine Co., Weymouth, Mass., will be completed within seven months. This vessel is designed as a relief ship for the fourth and fifth light-house districts. Light-ship No. 73, which is being built by Spedden & Co. of Baltimore, and which is designed for service on the Massachusetts coast, will be completed within nine months.



CROSS SECTION OF NEW LIGHT-HOUSE TENDER.



PLAN OF MAIN DECK



PLANS OF LIGHT-HOUSE TENDER FOR PACIFIC COAST.

AMENDMENTS TO SHIPPING BILL.

Washington, D. C., Feb. 7.—The sub committee of the senate committee on commerce will recommend to the general committee three important amendments to the shipping bill to meet certain objections which have been raised. One of these is to place a limit of $2,000,000 a year on the amount of subsidy to be paid to ships of the first class, which, it is expected, will remove the objection raised that the fast steamers would receive an undue proportion of the benefits of the bill. The sub committee has also recommended a material increase in the compensation to be paid the slower steamers. The third amendment reduces from 80 per cent to 51 per cent the required American ownership of foreign-built vessels which may be admitted to the benefit of the subsidy.

Central Passenger Association mileage tickets will be accepted for passage on trains of the Nickel Plate road on and after Feb. 10 18

MAGNIFICENT RIVER STEAMER.

THE TASHMOO, A VESSEL SIMILAR TO HUDSON RIVER BOATS, BUILDING AT DETROIT FOR SERVICE ON ST. CLAIR AND DETROIT RIVERS.

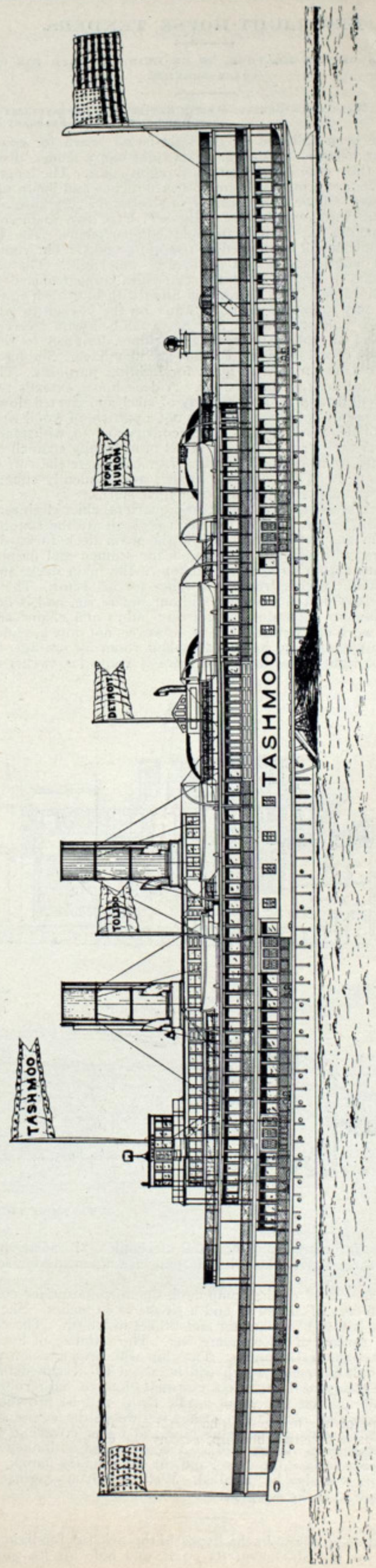
The past few years has seen a wonderful advance in the size and general pretentiousness of side-wheel steamers on the great lakes. Four of the finest side or paddle-wheel steamers in America are those in service between Detroit and Cleveland and between Cleveland and Buffalo; and now the connecting rivers (Detroit and St. Clair) between Lake Erie and Lake Huron, are to have a magnificent light-draught steamer that will be in every respect equal to the handsome vessels of her kind on the Hudson river. The new steamer is the Tashmoo, which is being constructed by the Detroit Ship Building Co. of Detroit, Mich.

The Tashmoo is 312 feet in length over all, 300 feet on water line, 37½ feet breadth, 69 feet breadth over all, 13½ feet depth and 8 feet draught of water. The hull, which is constructed throughout of mild steel, is divided into six holds by five watertight bulkheads. On the main deck, which is of selected Oregon pine, is arranged a large saloon, forward of the shafts, with double entrance gangways on each side and broad stairs of mahogany leading to the lower and upper saloons. Immediately aft of the shaft is a large lobby, with entrance gangways on each side. The deck is covered with rubber tile, as are the stairs to the upper saloon. At the forward end of the lobby is a refreshment room. Aft is the main cafe, with an entrance on either side of the stairs. The private dining room is at the extreme after end and the galley, mess and store rooms are in the hold immediately under the cafe. On the promenade deck is the main saloon, extending about one-half of the entire length and on either side are arranged five large private parlors with bay windows. On the upper deck, which is arranged for the accommodation of passengers, is located the smoking room and quarters for the ship's officers. The pilot house is located on top of the smoking room. As the vessel is to be devoted exclusively to day service, only a few state rooms will be provided for use in case of sickness of passengers or emergencies of any kind. In cabin arrangements and the general furnishing of the vessel, no expense will be spared. An effort will be made to have the dining room especially elaborate and another part of the vessel in which every adjunct of luxury is to be provided is the smoking room, previously mentioned. This apartment will be 42 by 23 feet, and will be provided with a glass roof and sides, the latter permitting of an excellent view in all directions.

The steamer will be propelled by an inclined triple expansion engine, driving paddle-wheel propellers. The cylinders are 33, 51 and 82 inches in diameter and the stroke of piston 6 feet. The high pressure cylinder is fitted with a piston valve and the intermediate and low pressure cylinders have double-ported slide valves, all driven by the usual link motion. A direct steam reversing engine is provided. The crank shafts are 15½ inches in diameter; the wheel shafts 18 inches in diameter; and the cranks of steel set 120 degrees from each other. The pillon blocks are of cast steel and connected to cylinders with wrought iron struts, which also form the guides for the crossheads. The paddle wheels are of the feathering type, 22 feet 4 inches in diameter over buckets, 12 feet face, with nine steel buckets 3 feet 9 inches wide. The wheel centers are of semi-steel and the arms of steel channels The air pump is vertical and worked by the high pressure engine with a pair of levers. The discharge is led through pipes and valves to tanks arranged on the guards to trim the steamer when required.

Steam will be supplied from two double-ended and three single-ended cylindrical boilers, 11 feet 1 inch in diameter and 22 and 11 feet 1 inch in length, respectively. The total heating surface on the tubes is 2,057 square feet and the total heating surface in furnaces is 443 square feet, thus affording an aggregate heating surface of 2,500 square feet. The grate area with 6-foot bars is 84 square feet. There are 312 tubes in one boiler. The working pressure is 170 pounds, and the boilers are equipped with fourteen suspension furnaces, 42 inches in diameter. The boilers are located in the hold, entirely under the main deck. Two stacks are provided, each 6 feet 9 inches in diameter and 60 feet in height. They are surrounded by steel casings, extending from the main deck to 2 feet above the hurricane deck.

Duplicate electric generators are provided, having a total capacity of 800 lamps, and electric signal and search lights are also included in the equipment. Steam steering gear, capstans, etc., are provided. The steamer is expected to carry upwards of 4,000 passengers and will make 20 miles an hour, thus covering the round trip distance between Detroit and Port Huron and making the numerous stops at the pleasure resorts on the Detroit and St. Clair rivers, in four or five hours less time than any vessel that has yet been engaged on this route. The vessel is building for the recently organized White Star line of Detroit, of which B. W. Parker of that city is general manager. Should no unforseen difficulty intervene she will be completed and ready to go into commission June 1, 1900.



STEAMER TASHMOO, BUILT BY THE DETROIT SHIP BUILDING CO., DETROIT, MICH., FOR DAY SERVICE BETWEEN DETROIT AND PORT HURON, MICH.

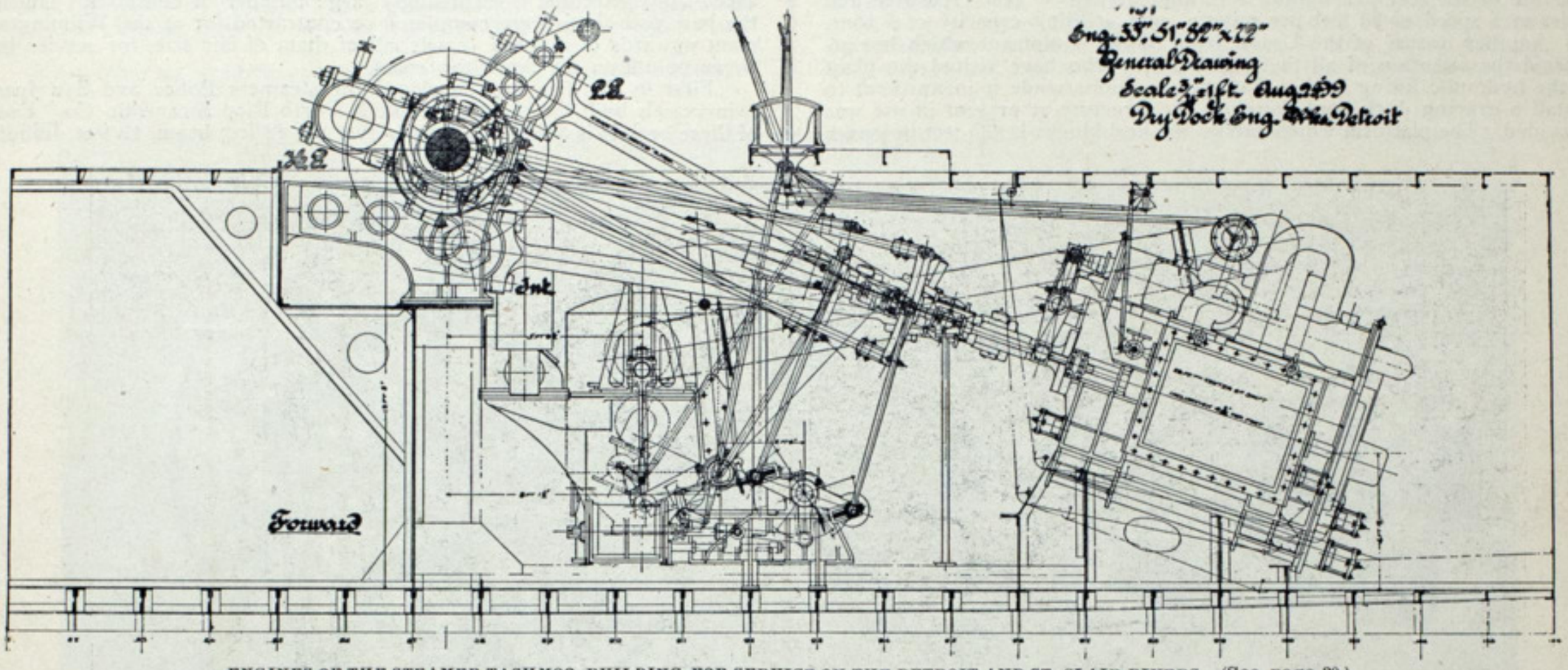
A BOOK FOR SHIP BUILDERS.

The Hilles & Jones Co. of Wilmington, Del., already well known to ship builders, has just issued a handsome cloth-bound volume of upwards of 200 pages descriptive of their tools. It is a most elegant work. Descriptions accompanying the pictures are brief, but will be found quite sufficient, inasmuch as the magnificent half-tone plates indicate very clearly the character of the different tools. The company offers also, in cases where the information proves insufficient, to supply the fullest details. Among the machines pictured and described are punches, shears, beam and channel coping and notching machines, spacing tables, rail straightening presses, riveters, bending and straightening presses, plate benders, plate bending rolls, plate bending and flanging rolls, milling machines, etc. The Hilles & Jones Co. has recently built up an extensive export trade and this new work will be especially appreciated by their foreign customers.

POSSIBILITIES OF THE PACIFIC.

THE DISTRICT THAT SEEMS TO OFFER A GREAT FUTURE FOR AMERICAN SHIP BUILDING—WHAT HAS BEEN DONE BY A FEW WORKS ON THE WEST COAST.

Seldom have all imaginable influences tended with such perfect unanimity to the encouragement of the shipping and ship building interests of a country, or section of a country, as in the case of the Pacific coast of the United States at the present time. Our acquisition of Hawaii, the Philippines and other possessions in the Pacific, the prospects of early consummation of the Nicaragua canal project, the proposed Pacific cable, the opening of China, and the new conditions to be brought about by the opening of the trans-Siberian railroad are only a few causes for this opinion. If proof be desired that the development of the Pacific coast is a present day reality rather than a prophesy, it may be found in the fact that the Newport News company, the Cramps and Roach Ship Yard, three of the largest works on the Atlantic coast, are now engaged in the construction of eight modern steel steamers of great capacity for Pacific service—some of them larger than any vessels as yet built in America.



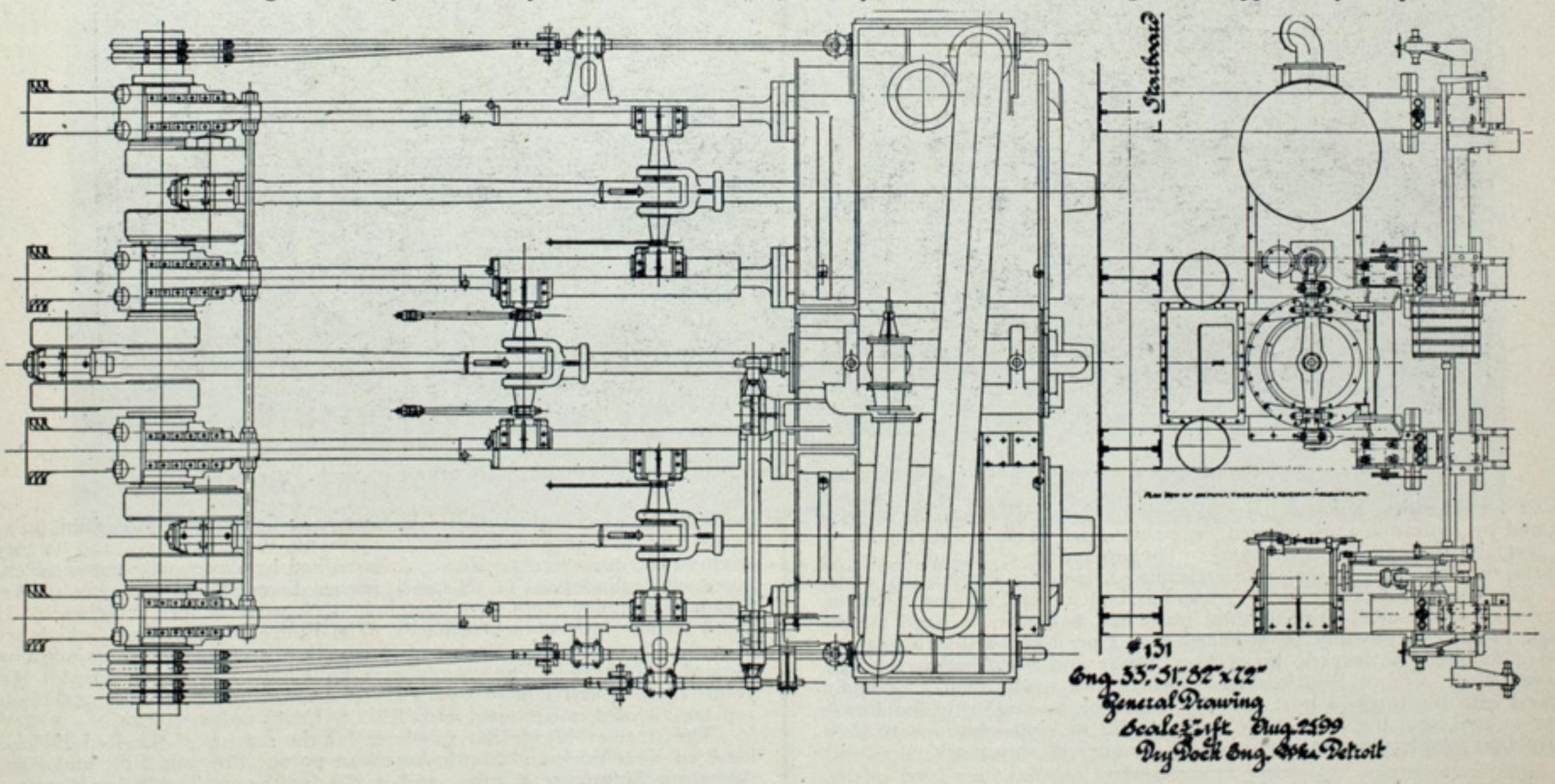
ENGINES OF THE STEAMER TASHMOO, BUILDING FOR SERVICE ON THE DETROIT AND ST. CLAIR RIVERS. (See page 30.)

save the steamers for the International Navigation Co. These vessels are building at eastern yards primarily because the yards on the Pacific coast were too crowded to undertake the work, and yet everything in the way of a works for building ships from Puget sound to Mexico has been considerably enlarged and modernized within the past year. It is true probably that this transfer of large contracts to the Atlantic coast is due largely to the fact that the Union Iron Works, now crowded with work, is the only very large establishment on the Pacific, but other concerns of modest proportions up to this time are coming to the front and they will be heard from shortly.

Mr. Irving M. Scott, general manager of the Union Iron Works, sounded the key note when he recently declared that the possibilities of ship building on the Pacific coast at the present time open up a vast vista and that the Pacific coast holds the most charming and alluring prospects for the future. A climate conducive to all-the-year-round ship building, low cost of living for workmen and an abundance of Oregon pine, are all points in favor of the coast, and there are now being marshaled to the aid of the Pacific builders other influences, less direct in effect perhaps but none the less beneficial, such as the provision of improved dry dock facilities.

Nor is the promise for the future devoid of the foundation of present achievement. Within the past eighteen months there have been turned out at Pacific coast ship yards five torpedo boats, every one of which exceeded contract speed. This showing is the more remarkable when it is noted that four of these vessels were built at two newly established plants, neither of which had ever previously been entrusted with a contract by the United States navy department. In the construction of light-draught vessels for Alaskan service the Pacific coast builders established some surprising records for speedy construction, and moreover many of these vessels were given an opportunity to prove their seaworthiness in trips on the Pacific from the point of construction to their destination. Finally naval architects are beginning to give attention to the designing of vessels especially adapted to coasting service on the Pacific, which is perhaps after all the most encouraging sign, as the coastwise trade is of wonderful promise, no matter what the developments may be in foreign shipping.

New works growing up on the Pacific will, of course, all be of a modern kind, but they will still have an example to follow in the Union Iron Works of San Francisco, which is one of the most perfect ship building institutions on this side of the Atlantic. This plant has been a decade



ENGINES OF THE STEAMER TASHMOO, BUILDING BY THE DETROIT SHIP BUILDING CO. (See page 30.)

and a half in building and occupies upward of thirty acres of ground. There are seven building slips in this yard all arranged with special reference to facilitating the transfer of material. The Union Iron Works is the only American plant which has provided a framework covering the entire vessel while building, although it is probable that this same plan will be followed at the new works in the course of erection at Camden, N. J., by the New York Ship Building Co. These sheds are in some respects similar to those to be found at the yard of Swan & Hunter on the Tyne, England, but not at all planned after the English design. There are at the San Francisco yard four of these shelters, all built of wood. Three of them are each 300 feet in length, and one has a length of 400 feet. The width is 85 feet and the height varies from 58 to 78 feet. At each end of each shed is a crane. The cranes are electric and travel at the rate of 180 feet per minute fore and aft and 90 feet crosswise and hoist at a speed of 90 feet per minute, with a lifting capacity of 5 tons.

Another feature of the Union Iron Works equipment which has attracted the attention of all the ship builders who have visited the plant is the hydraulic lifting dock. Natural conditions made it inexpedient to install a graving dock, and therefore the structure at present in use was provided. The platform which carries the keel blocks is 435 feet in length by 62 feet breadth, and the operation of raising and lowering is performed by hydraulic rams ranged on either side. The maximum lift is 32 feet and the capacity 6,000 tons. The operation of the dock is, of course, on something of the same principle as that of a floating dry dock.

The Wolff & Zwicker Iron Works has built up at Portland, Oregon, a very extensive steel ship building plant and has now on hand all the work which can possibly be attended to. They have within a year or two completed the torpedo boats Fox, Davis and Goldsborough. The Moran Bros. Co. of Seattle, Wash., which has made such a splendid record with the torpedo boat Rowan, only took up steel ship building a year or two ago, but have made and are still making additions to their plant that enable them to undertake all manner of ship work.

Recent launches at Bath, Me., were the four-masted schooner Marie Palmer from the yard of William Rogers and the barge Ohio from the New England company's yard. The latter, which is a vessel of 3,000 tons, is building for the Coastwise Steamship Co. The Palmer is the first of a fleet of five vessels which William F. Palmer of Massachusetts is having built. She is 236 feet long, 43 feet beam and 24 feet depth; of 1,904 gross or 1,594 net tons, and carries 7,600 square yards of canvas.

The Tietjen & Lang Dry Dock Co. of New York is furnishing the joiner work for the steamer Mount Morris, building by Peter Magee for the Harlen Transportation Co. Her machinery is being constructed by the W. & A. Fletcher Co.

LARGE COASTING FLEET.

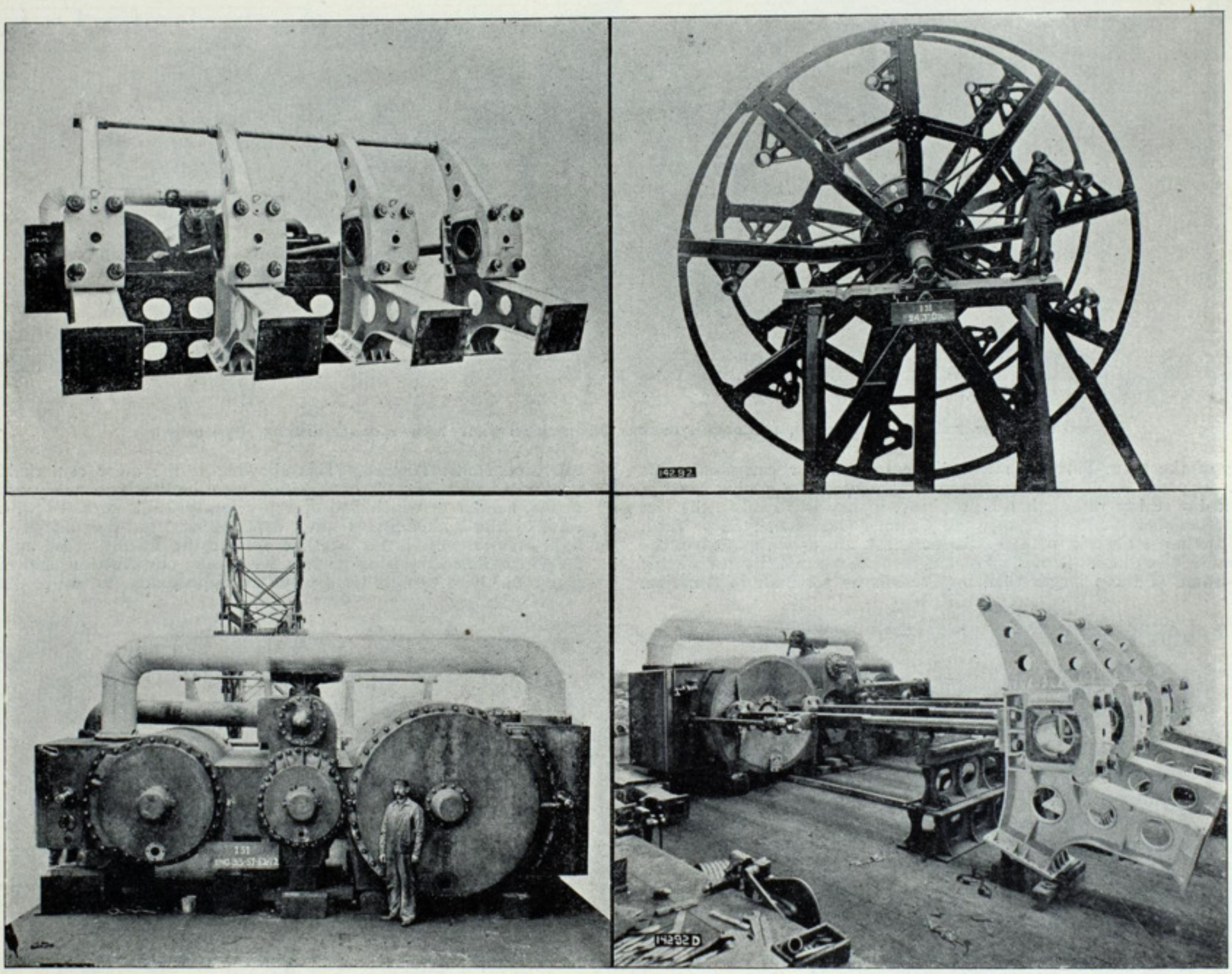
SEVERAL REPRESENTATIVE VESSELS INCLUDED IN THE WORK OF A SINGLE SHIP YARD, THAT OF THE HARLAN & HOLLINGSWORTH CO., WILMINGTON, DEL.

No influence imaginable could have given a greater impetus than did the Spanish war to the upbuilding of the steam coasting fleet of the United States. Some twenty-five vessels designed for freight and passenger service between Atlantic and Gulf coast ports were constructed in the ship yards of the country during the year 1899. Generally speaking this work was well distributed between the different plants, but one concern, the Harlan & Hollingsworth Co. of Wilmington, Del., secured and successfully executed a surprisingly large number of contracts. During the past year there were completed or contracted for at the Wilmington plant upwards of a dozen vessels, all of them of fair size, for service between points on the American coast.

First in this list may be placed the steamers Ponce and San Juan, twin vessels built for the New York & Porto Rico Steamship Co. Each of these vessels is 335 feet in length over all, 42 feet beam, 19 feet draught and of 3,250 tons capacity. Each steamer is fitted with watertight bulkheads and has accommodations for seventy-two first-class and twenty second-class passengers. Power is furnished by direct tri-compound engines with cylinders of 24, 38 and 62 inches diameter and 42 inches stroke. Steam is supplied from two Scotch boilers, each 14 feet 6 inches by 11 feet 6 inches, with 48-inch furnaces. The Ponce and San Juan, which are in service between New York and Porto Rico, are capable of maintaining a speed of 12 knots. The vessels were built under the supervision of Mr. John Haug. Each is fitted with a Hyde steam capstan windlass and Hyde capstan aft, and is equipped with Ellis & Eaves induced draft.

The steamer Maracaibo was built for the service of the Red D Line between New York and South American ports. She was built under the American Shipmasters' rules, and is 277 feet over all, 266 feet between perpendiculars, 37 feet beam, and is to carry 800 gross tons on a draught of 10 feet, with accommodations for about 100 passengers. She has seven watertight bulkheads, two steel masts and a tank capacity of 200 tons. This vessel is fitted with two triple expansion engines, with cylinders of 14, 22 and 36 inches diameter and 24 inches stroke of piston, to which steam is supplied from two Scotch boilers, 12 feet 3 inches by 12 feet. The boilers are fitted with six furnaces and work at 160 pounds pressure. Two Manganese bronze solid propellers are fitted.

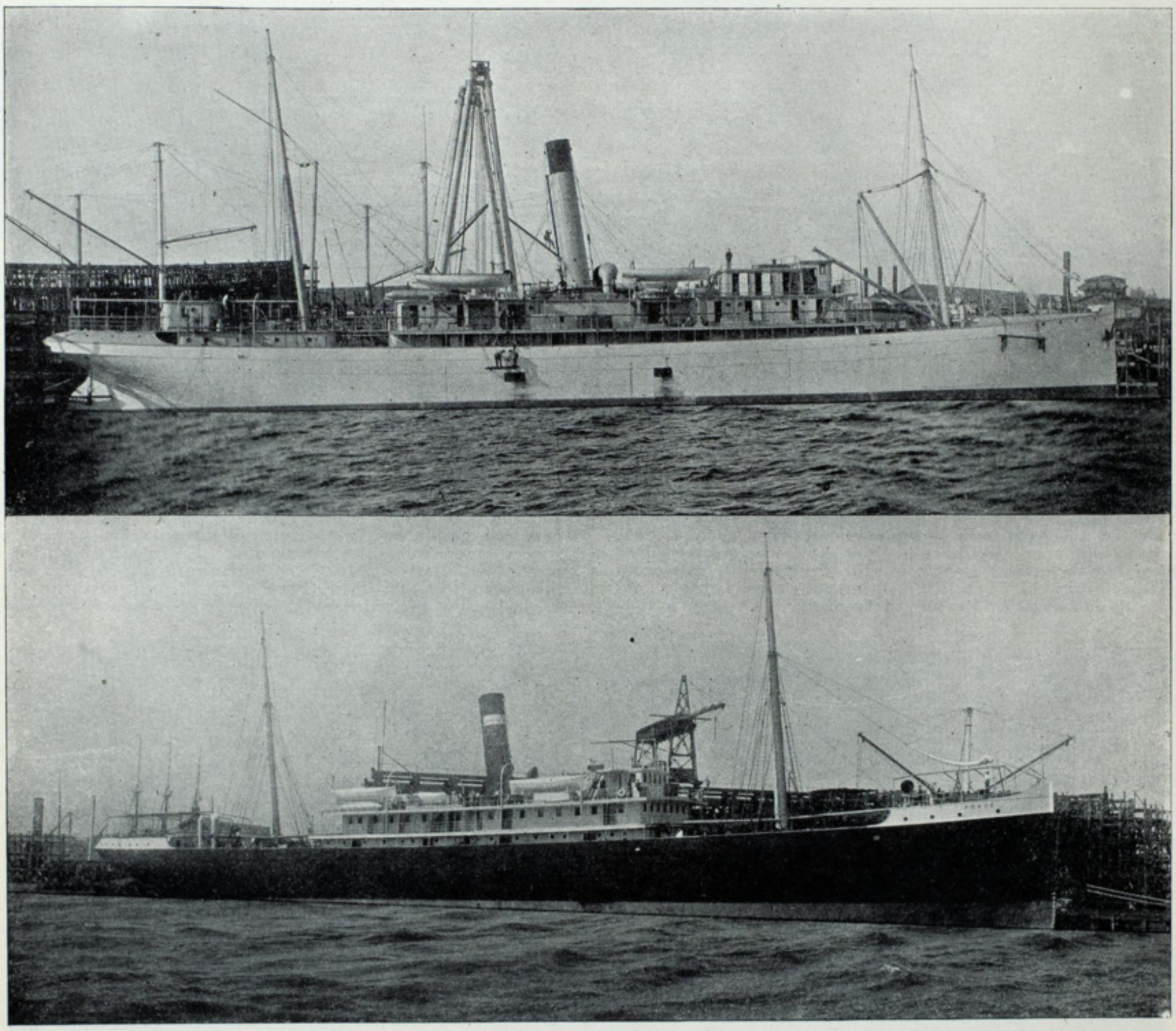
The steamer Grecian, constructed for the Windsor line, was another of the handsome products of the year at the Harlan & Hollingsworth yard. The Grecian is the fourth vessel built at the Harlan & Hollingsworth works for the Boston & Philadelphia Steamship Co. Others were



PARTS OF MACHINERY FOR SIDE-WHEEL STEAMER TASHMOO, BUILDING FOR DETROIT AND ST. CLAIR RIVER SERVICE. See page 30.)

the Indian, Spartan and Parthian. She is a three-deck freight and passenger steamer, 290 feet in length over all, 263 feet between perpendiculars, 42 feet beam molded, 36 feet depth, and 18 to 20 feet draught, loaded with 2,500 tons. In this vessel there are four watertight bulkheads, four hatches, four side ports on each side, four single cylinder Williamson winches, Hyde steam windlass capstan forward and aft, two steel masts and a steel deck house, with accommodations for about 100 passengers. There are two electric light plants of 200 lights each and an 18-inch search light. Engines are of the inverted triple expansion type with cylinders of 25, 41½ and 68 inches diameter and 42 inches stroke. Steam is supplied from four cylindrical boilers, 12 by 10½ feet, each having two furnaces of 40 inches inside diameter and built to sustain a working pressure of 170 pounds. The cast iron wheel is of 15 feet diameter. Other features of the vessel are: Ellis & Eaves induced draft; a Scot donkey boiler of 8x10 feet; bunker capacity, 275 tons; speed of 15¾ knots on eight hours' trial.

Other coasting steamers constructed at this same yard and worthy of mention include the Nantucket, built to run between Baltimore and Boston for the Merchants' & Miners' Transportation Co.; two freight steamers for the New York & Baltimore Transportation Co., and a freight and passenger steamer for the Metropolitan Steamship Co. The Nantucket is 294 feet over all, 42 feet beam, 18 feet draught. She is of 2,600 tons measurement, has a dead weight carrying capacity of 2,000 tons and ample accommodation for a large number of first and second-class passengers. Engines are of 28, 45 and 72 inches diameter and 54 inches stroke, and steam is supplied from four Scotch boilers, 14½ by 12 feet. The vessel has a speed of 16 knots. The two freight steamers for the New York and Baltimore line are each 219 feet over all, 32 feet beam and 13 feet depth. They are fitted with triple expansion engines, with cylinders of 18, 28 and 45 inches diameter and 30 inches stroke. Steam supplied from two Scotch boilers, 11 by 10½ feet. The freight and passenger steamer for the Metropolitan Steamship Co., which is not yet completed, is 288 feet over all, 43 feet beam and 19 feet depth. She will be fitted with triple expansion engines with cylinders of 29, 46 and 75 inches diameter and 46 inches stroke. The four boilers are each 13 feet long and 14 feet in diameter.



TWO REPRESENTATIVE VESSELS OF THE COASTING FLEET BUILT BY THE HARLAN & HOLLINGSWORTH CO., WILMINGTON, DEL. STEEL STEAMER MARACAIBO, BUILT FOR VENEZUELAN SERVICE, AND RED D LINE STEAMER PONCE (SISTER OF SAN JUAN) BUILT FOR NEW YORK & PORTO RICO STEAMSHIP CO.

NEW SHIP YARDS OF THE YEAR.

BRIEF SUMMARY OF NEW PROJECTS AND IMPROVEMENTS IN VARIOUS PLANTS ALREADY ESTABLISHED.

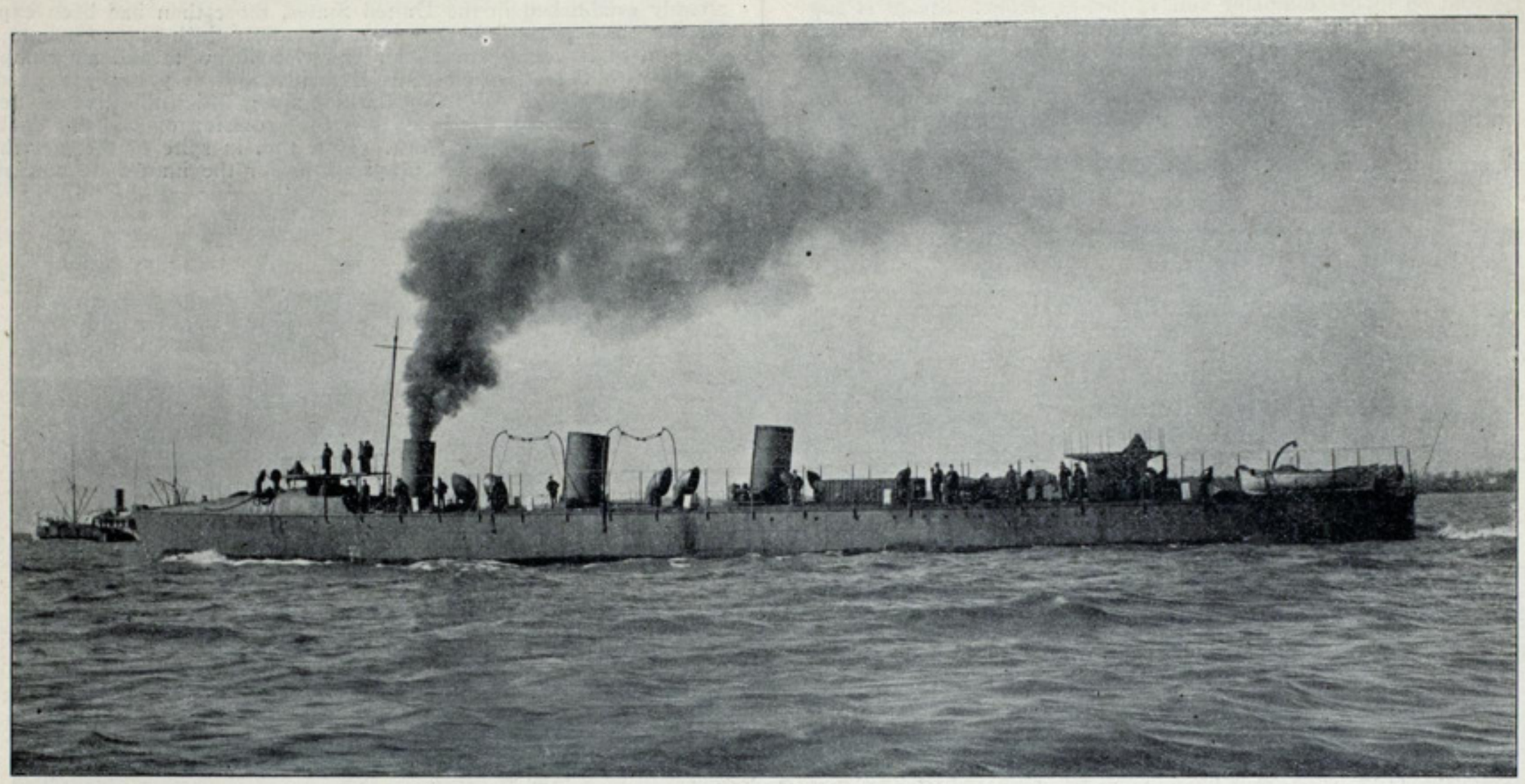
Although no statistics on the subject are available, it is safe to say that there has been expended during the past fifteen months in the equipment of new ship yards and the enlargement of several of those already established in the United States, more than had been expended for this same purpose in ten years previous. Such improvements as the erection of traveling cranes, air and electric hoists and air compressor plants with the attendant tools have involved very heavy expenditures at the older works. Possibly the line along which the greatest development may be noted, however, is in the provision of new dry docks and other facilities for repair work. This, too, in spite of the fact that the navy department has made preparations for the immediate construction of four new dry docks of the largest size, as well as one floating dock, which will exceed in dimensions anything in the world. Of the new dry docks provided at private ship yards those at the works of the Cramps and the Newport News company on the Atlantic coast and the West Superior yard of the American Ship Building Co. on the great lakes, are most important. A very large dry dock is also being built at West Bay City, Mich., by Capt. James Davidson, and dry dock enlargement work is under way at the plant of the Buffalo Dry Dock Co., Buffalo, N. Y.

Of first importance in a brief reference to the new plants is the progress made by the New York Ship Building Co., of which Mr. Henry G. Morse is president and which is erecting a very large works at Camden, N. J. The company was only incorporated within the year, and even after the site for the ship yard was secured there was necessarily a large amount of work to be done before the ground could be gotten ready for the building foundations. At the present time, however, upwards of 700 men are employed and some of the buildings are well under way, one or two of the smaller having been completed. The main shop for the ship yard, which is 1,220 feet in length, 250 feet in width and 70 feet in height, is in frame. A considerable portion of the machinery equipment for the

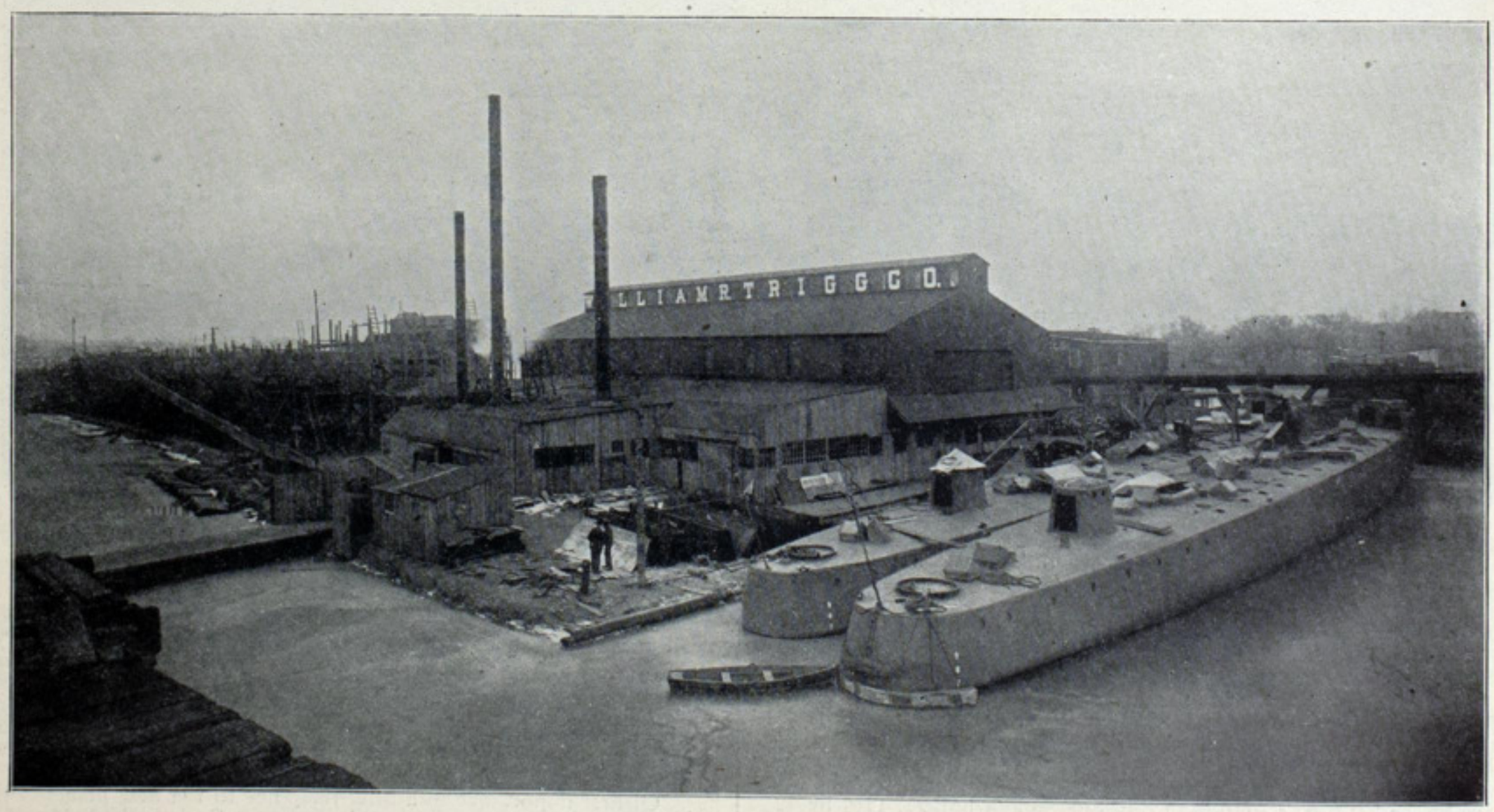
department of hull construction is already on the ground and it is hoped to begin the building of vessels within the next six months. The latest report regarding these works is that new interests have been taken in and the capital increased to $10,000,000.

A great ship building plant will unquestionably be the outgrowth of the enterprise established only a short time ago by the William R. Trigg Co. at Richmond, Va. Indeed this company, which now has on hand contracts for six vessels for the United States navy, announces that it will, should the ship subsidy bill become a law, reorganize the corporation on a capital of $2,000,000 and give employment to fully 3,000 men or about four or five times the number of men at present employed. Efforts are also being put forth to secure congressional appropriations for the deepening of the James river, in order to allow access to the port of Richmond by the deepest draught vessels. Several other enterprises for the present year, but which have not, however, taken tangible form as yet, are also announced. The firm of Townsend & Downey, already in ship building in a small way in New York, are organizing a large company and propose to establish a plant on Shooter's island in the vicinity of New York; a $1,000,000 plant is projected by gentlemen already connected with a Pennsylvania yard, and New Orleans capitalists announce that they have all but completed arrangements for the establishment of a ship yard and dry dock at that port.

To enumerate the works that have been enlarged or improved would be to present a list of almost every ship yard of any size in the country. On the great lakes, the consolidation of almost all the principal yards under the control of the American Ship Building Co. has resulted in many improvements in equipment, notably at the Chicago and Detroit works of the consolidation. Of the immense expenditures at the Cramp plant, Philadelphia, an extended account is given elsewhere in this issue. The Newport News yard has been provided with several new traveling cantilever cranes and has under construction a very large dry dock. Moreover, there is a strong probability that this year will see the erection shortly of an armor factory, modern in every way. Among the New England yards the Fore River Engine Works and the Bath Iron Works have each spent a very large amount of money in improvements and still further expenditures are contemplated. The reopened marine department of the Maryland Steel Co. at Sparrow's Point, Md., has had a most prosperous year, and Lewis Nixon of the Crescent ship yard, Elizabeth, N. J., has just purchased additional property adjoining his own and is preparing to broaden the scope of the Elizabeth works. The Electric Launch Co., a branch of the Electric Boat Co. of New York, has practically decided to put up an extensive plant in New Jersey.



TORPEDO BOAT STRINGHAM, BUILT BY THE HARLAN & HOLLINGSWORTH CO., WILMINGTON, DEL.



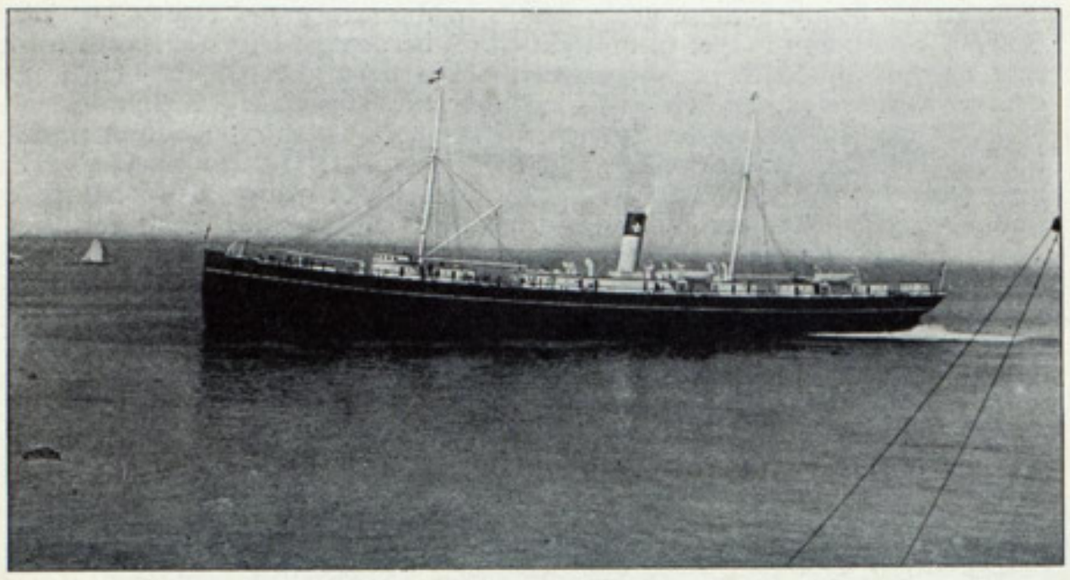
GENERAL VIEW OF THE WORKS OF THE WILLIAM R. TRIGG CO., RICHMOND, VA.

An associated press dispatch from Philadelphia announces that the strike at the Cramp works, which has been in progress since last August, has been declared off by representatives of the strikers.

FULL SHARE OF PROSPERITY.

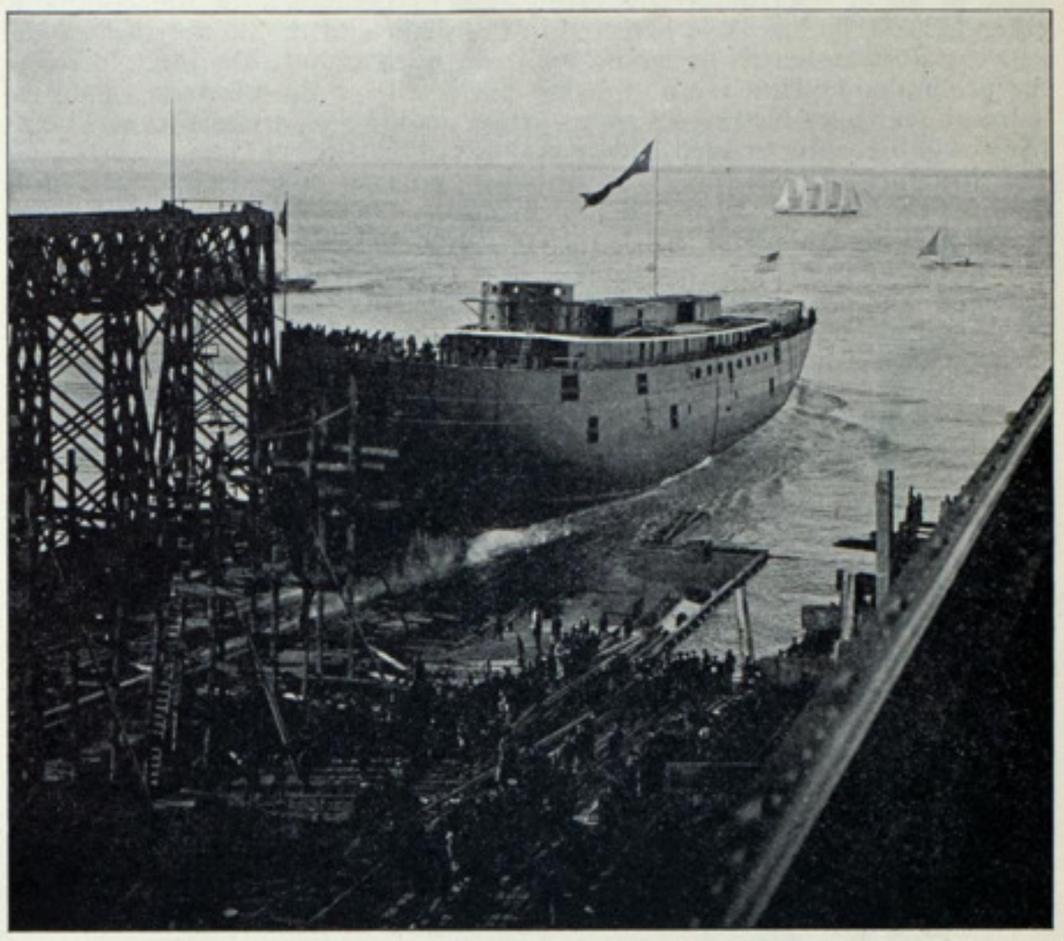
SUMMARY OF A YEAR'S WORK AT ONE OF AMERICA'S LEADING SHIP YARDS, THE NEWPORT NEWS YARD, NEWPORT NEWS, VA.

The Newport News Ship Building & Dry Dock Co. of Newport News, Va., has assuredly had its full share of prosperity during the past year. The aggregate value of the new vessels and repair work within the twelvemonth has never had a parallel in any single yard in the history of American ship building. Two first-class battleships were completed



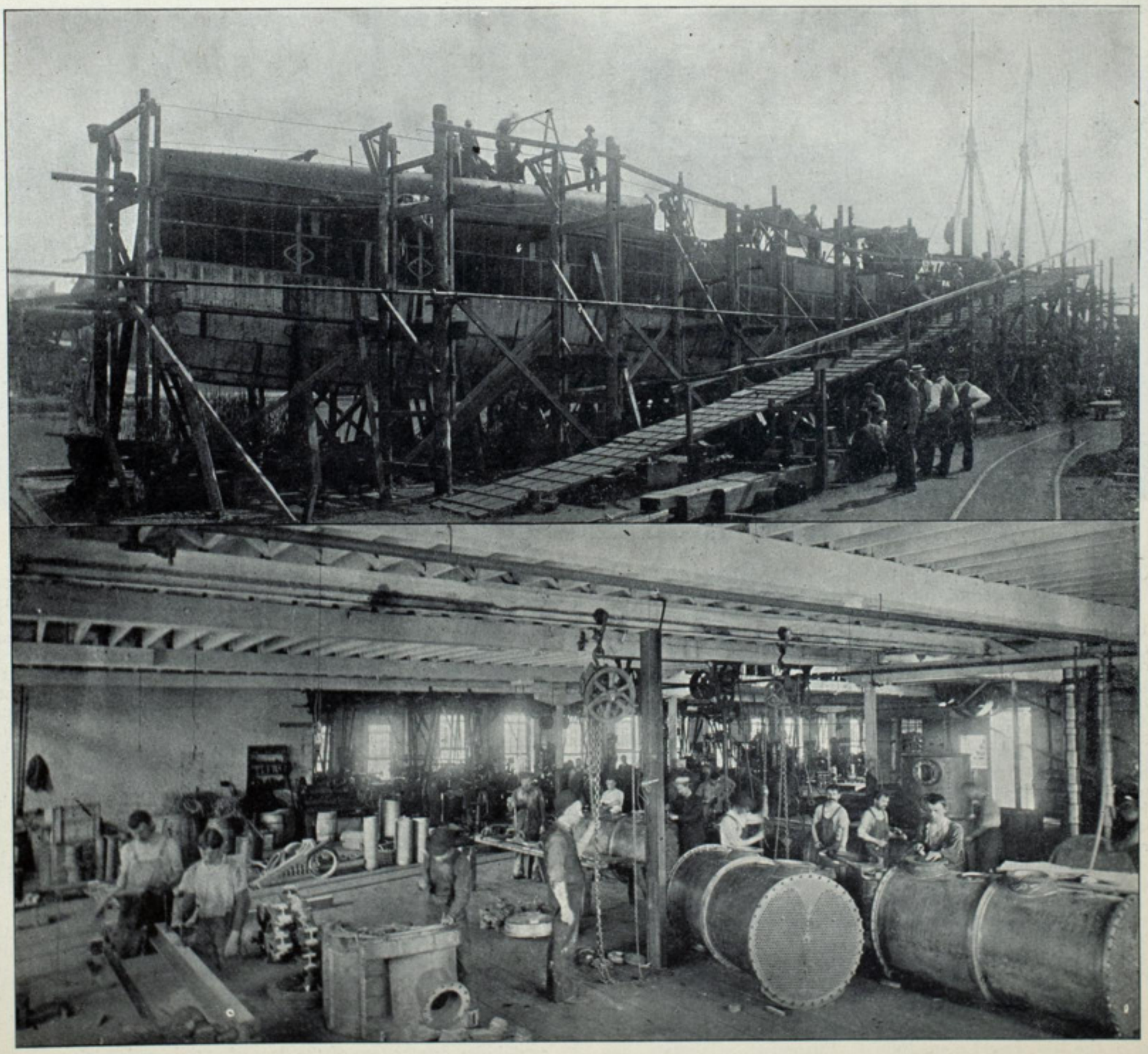
ONE OF THE NEW MORGAN LINERS JUST COMPLETED AT NEWPORT NEWS.

and work upon two others and a monitor well advanced, while a fleet of six merchant vessels and a tug were constructed and delivered complete to the owners. There are at the present time on the payroll of this company more than 7,000 men, and Mr. Collis P. Huntington himself made the statement a fews days since that employment could have been given to at least 3,000 in addition could they have been secured. The growth of the Newport News works has been marvelous. When Mr. Collis P. Huntington, the principal owner of this ship yard, originated the project, the city of Newport News, which now has a population of 20,000 people, included less than 1,000 persons all told. At the outset several men were



LAUNCH OF THE CROMWELL LINER PROTEUS AT NEWPORT NEWS.

associated with Mr. Huntington in the plan to establish a ship yard, but to use his own words they speedily concluded that they had no taste for that sort of business when they discovered, at the end of the first year,



VIEW OF MACHINE SHOP AND A TORPEDO BOAT DESTROYER BUILDING AT THE WORKS OF THE WILLIAM R. TRIGG CO., RICHMOND, VA.

that no dividend on their investment was an immediate probability. Mr. Huntington stood unshaken in his confidence that ultimately the returns from the investment would be large, and so he unhesitatingly took up the holdings of such of his associates as had expressed a wish to retire. Now he is in control of the great bulk of the stock of the company. Over $12,000,000 has been invested in the plant and the completion of the new dry dock now well under way will add $2,000,000 to the total. Finally the preliminary plans are now being perfected for the ultimate establishment at Newport News of a great armor making plant, so that the company will be able to turn out a completed battleship, fitted with arms and armament and ready to immediately go into commission, just as is done at some of the largest British works.

But to return to the work turned out during the past calendar year. Of the great improvements to the yard (the traveling cantilever cranes installed and the new machinery equipment provided) something has been said elsewhere. With the record of the two new battleships Kearsarge and Kentucky, each of which exceeded contract speed on official trial, readers of the Review are already familiar. Passing these, we come to perhaps the most remarkable achievement of the year, the designing, construction, trial and delivery within a single year of a fleet of steamers of very fair size for coastwise passenger and freight service.

Four of the six vessels just referred to were constructed for the Morgan line and the other two, the Comus and Proteus, for the Cromwell line. In general dimensions and in practically every detail the six vessels are identical. Each of the vessels cost in the neighborhood of $600,000 and is 406 feet in length over all; 380 feet between perpendiculars; 48 feet beam, molded; 33 feet 9 inches depth to awning deck; gross tonnage, 4,665; net tonnage, 2,905. The hulls are of steel throughout, the outside plating having vertical lap joints below the water line. Each steamer has three continuous decks, a partial orlop deck at forward end of forehold and a promenade deck at top of main deck house extending about 180 feet in length. Each vessel is subdivided into watertight compartments by transverse bulkheads. A steam windlass and also steam capstans, made by the American Ship Windlass Co., are provided for handling anchors, hawsers, etc. Accommodations are provided for fifty first-class passengers amidships and nearly 190 steerage aft. The dining saloon is located on the hurricane deck forward of the boiler space and extends from side to side of the deck house. Each vessel is lighted throughout by electricity. A search light is placed in crow's nest on the foremast. All running lights are connected to a Russell-See electrical indicator placed in the pilot house. The main engine is of the vertical triple expansion type, with cylinders of 33, 52 and 84 inches diameter and 54 inches stroke of piston. The steam is distributed by piston valves controlled by improved Marshall-See valve gear. Steam of 180 pounds pressure is supplied by three double ended cylindrical boilers, 13 feet 10 inches in diameter and 20 feet 6 inches long. The air and bilge pumps are worked from the main engine, while the feed pumps are independent duplex. The shafts are of open hearth steel. The propeller is built up with hub of steel and blades of manganese bronze. Ashes will be removed from fire rooms by a See hydro-pneumatic ash ejector.

The tug, which was built at Newport News for the Morgan line at the same time, is 96 feet in length, 22 feet beam and 12 feet depth and is fitted with vertical compound engines of 450 horse power, to which steam is supplied from a Scotch boiler.

Another of the lake vessel men, John C. Fitzpatrick of Buffalo, has gone to California, not to return until about April 1.

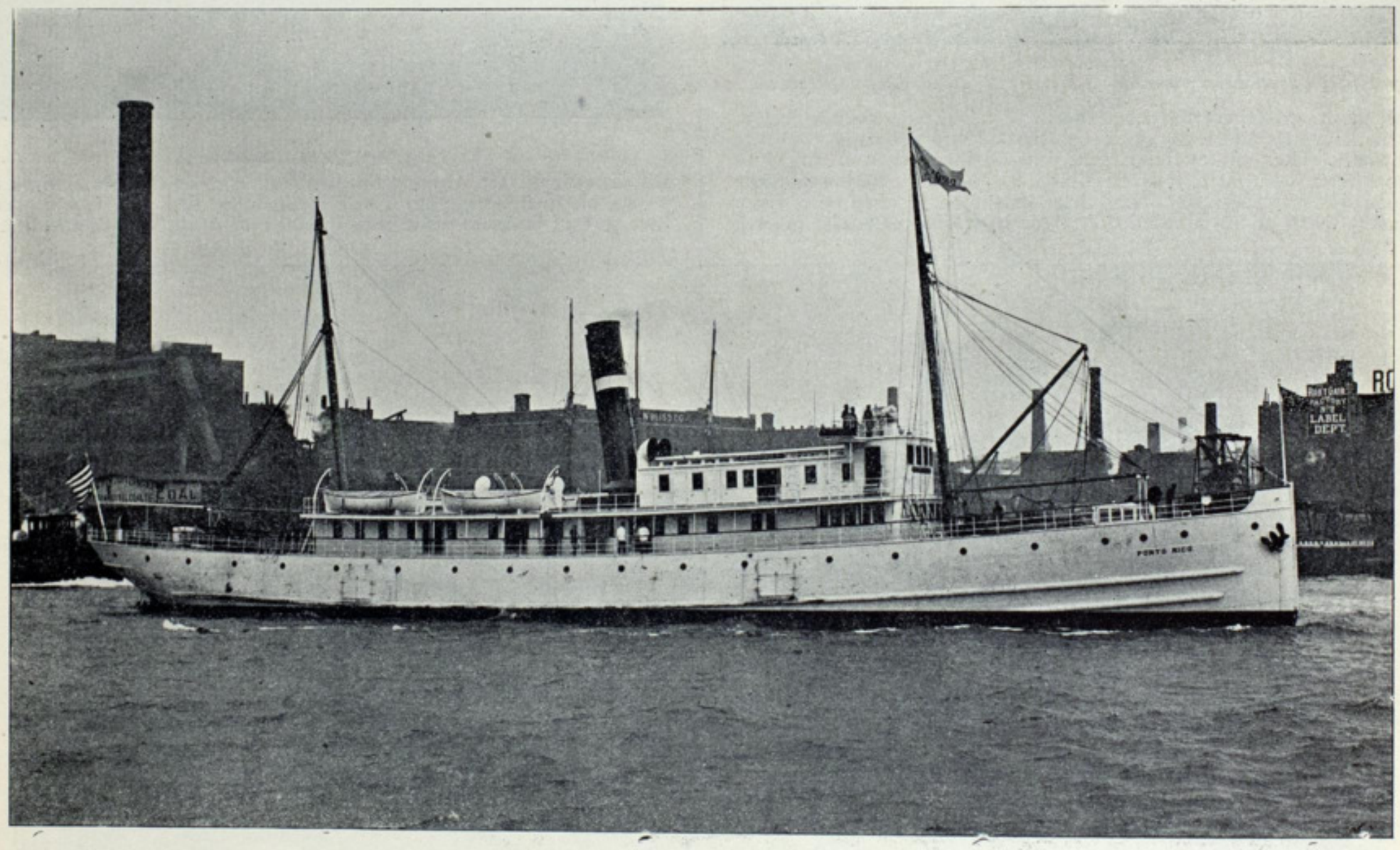
FROM LAKES TO SEABOARD.

A VIEW OF CONDITIONS PRESENTED TO SHIP BUILDERS OF THE ATLANTIC COAST AND THE GREAT LAKES BY THE OPENING OF CANADA'S ST. LAWRENCE RIVER CANALS—PROPOSED NEW YORK STATE CANAL IMPROVEMENTS.

With Governor Roosevelt and the people of New York (especially New York city and Buffalo) thoroughly interested in a radical enlargement of their canals at an expense of $50,000,000, so as to admit of the passage of barges carrying 1,000 tons, and with assurance from the Canadian government that 14 feet navigation will be provided through the St. Lawrence next spring to the Atlantic seaboard, it is expected that the competition between these grain routes in the future will reduce carrying charges to figures as yet unthought of. The struggle for the grain trade that has prompted these improvements has been the subject of a great deal of discussion, especially as regards the supremacy which Canada seeks in her St. Lawrence system. But there is another interest, ship building on the Atlantic coast and the lakes, that will be affected even next year by the Canadian waterway, and about which little has been said. Already there are building in England and on the Clyde for Canadian owners, three or four vessels of canal dimensions, and it is well known, of course, that a dozen or more ships turned out of lake yards of late, or now under construction, are specially designed for the canal trade; or they may be, as in the case of two ships built recently at Toledo, turned over to Atlantic coast service at once in competition with vessels built on the seaboard.

Vessels of various kinds have, of course, been transferred from the lakes to the coast and vice versa at intervals during a number of years past, but the operation was in each case attended with so much trouble, as well as expenditure of time and money, as to make it impracticable, excepting in cases where a special end was to be attained. In the first place many of the vessels exceeded in size the dimensions of the canal locks and these it was necessary to cut in two, each section being pontooned through separately and the two sections rejoined at Montreal. Then again a large number of vessels transferred were of greater draught than was to be found in two or three of the canals and it was necessary to raise the boats on pontoons in order to pass them through. Another difficulty which attended these operations is well illustrated by the mishap that befell one of the United States revenue cutters which was transferred from the lakes to the Atlantic coast during the Spanish war. One portion of the divided vessel rolled from the pontoon on which it was being carried and sank, necessitating a delay of several weeks for the wrecking operations incident to its recovery. In addition to three revenue cutters, Gresham, Algonquin and Onondaga, there have been transferred from the lakes to the Atlantic of late years all sorts of vessels, including whalebacks, light ships, tugs built for ocean service, oil barges and the larger-size private yachts.

Another part of the plans heretofore to be followed in the transfer of a vessel to the seaboard and which was fraught with no little danger, was the "shooting" of the rapids of the St. Lawrence. Resort to this method was taken in cases where the vessels were of light draught but too large for the locks, but the operation was always attended with difficulty and considerable danger of loss. One of the oil barges of the Standard Oil Co. met with an accident in attempting the passage over the rapids, as did also one or two of the fleet of vessels which lake owners chartered a little more than a year ago to the Atlantic Transportation Co. of



STEAMER PORTO RICO, BUILT BY THE CRAIG SHIP BUILDING CO., TOLEDO, OHIO, FOR OCEANIC SERVICE.

New York for employment in the coal-carrying trade between Newport News and New York.

TYPE OF EXTREME CANAL-SIZE VESSEL.

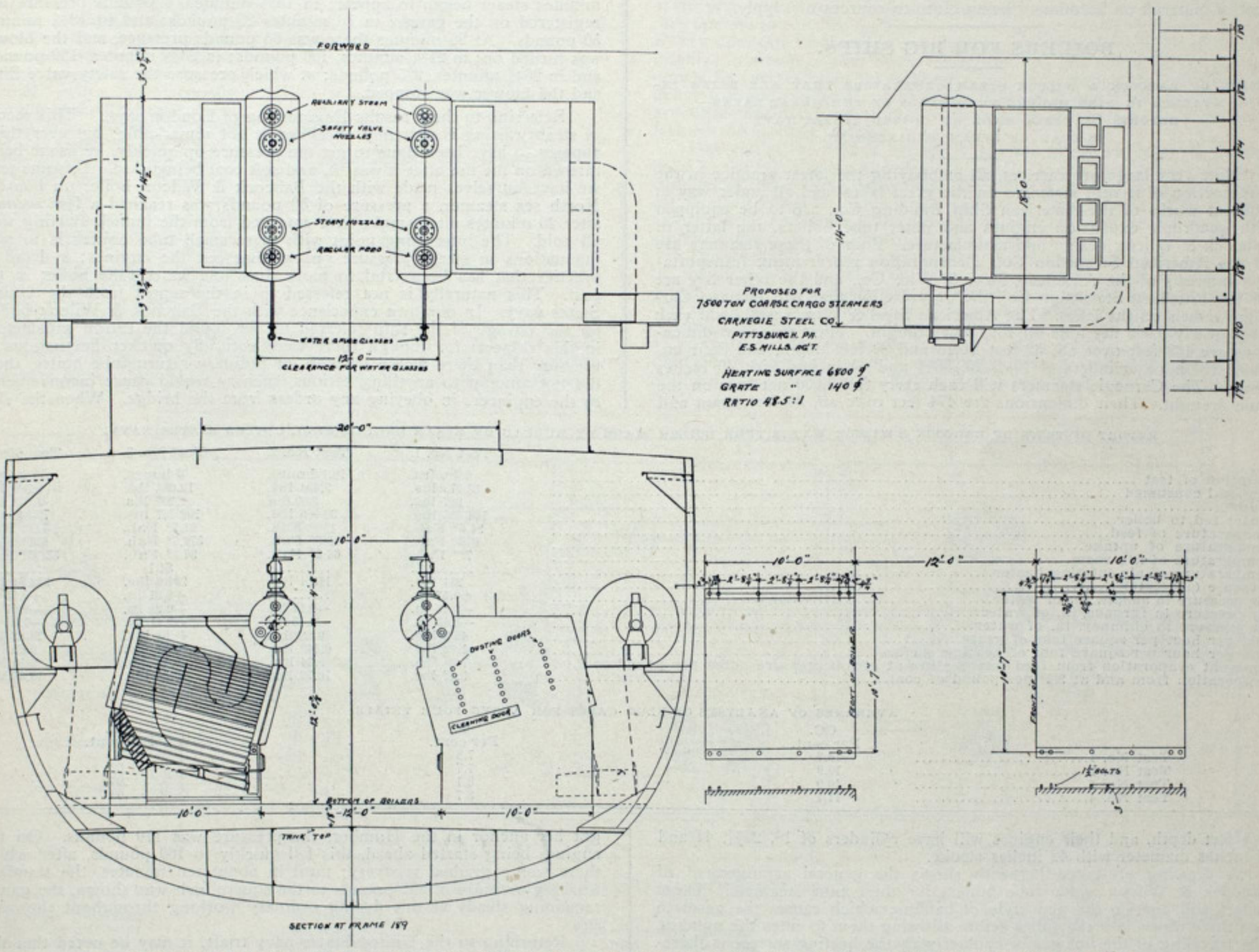
Under the new conditions which Canada promises with the opening of navigation in the spring of 1900 practically all of these difficulties will be obviated, and any vessel which can pass the Welland canal of 14 feet draught, connecting lakes Erie and Ontario, will be enabled to proceed on to the seaboard without difficulty. So also will the passage be clear for such vessels up to the lakes, which was not the case with vessels sent down over the rapids. The Welland locks are 270 feet in length from the mitres of the gates and 45 feet in width, but the size of vessel which may pass through without difficulty ranges from 250 to 260 feet over all. Generally speaking the "canal size steamer," of which a number are now under construction in lake yards, being especially designed for the service between upper lake ports and Montreal, is a vessel of about 238 feet keel, 42 feet beam and 26 feet hold, capable of carrying about 2,700 tons on 14 feet draught. There are about a dozen separate canals in the St. Lawrence system, and their enlargement to accommodate vessels of 14 feet draught has entailed an expenditure of more than $5,000,000. This new waterway seems to promise much in the way of development of traffic, although it of course remains to be seen whether all promises will be met. It is unfortunate for Canada that these canals, so long under construction, were not planned on a broader scheme as to dimensions. The modern lake freighter will deliver to the railroads and Erie canal at Buffalo three times as much grain as may be carried by a vessel of St. Lawrence canal size.

That the ship builders of the lakes will profit by the enlargement of the St. Lawrence canals seems quite probable. There are now building or have recently been completed in lake yards eight or nine vessels designed with reference to maximum canal dimensions. Several of these are designed for the traffic to Montreal, with a possible transference to the coast in case the other trade does not prove profitable, while others are designed for oceanic service from the outset. The first of these latter was the Mae, completed during the autumn of 1899 at the works of the Craig Ship Building Co., Toledo, O., for the New York & Porto Rico Steamship Co. (Miller, Bull & Knowlton) of 32 Broadway, New York city. This vessel was regarded with especial interest by coast ship builders when she made her appearance in New York, by reason of the fact that she afforded a fair example of the capabilities of the fresh water ship builders in providing coasting vessels for the seaboard. The Mae is a single-screw steel steamer of 2,100 tons gross and 1,200 tons net measurement; length over all, 263 feet; beam, 42 feet; depth, 25 feet; speed 10 or 11 knots per hour when loaded; coal consumption, about 20 tons per 24 hours; wooden 'tween decks laid throughout; mean draught, fully loaded, 19 feet; dead weight capacity, 3,000 tons; cubic capacity about 130,000 feet for cargo; bunker capacity, 350 tons; steam steering gear; steam windlass; four Lidgerwood hoisting engines and connections; donkey boiler, 9 feet long by 7½ feet in diameter, capable of driving all winches at once; four hatches, two 16 by 20 feet and two 16 by 16 feet; water ballast in cellular double bottom; four watertight steel bulkheads; evaporator and ash ejector; copper and brass piping throughout; bilge keelsons, 125 feet long on each side; Ellis & Eaves induced draft; triple expansion surface condensing engines, with cylinders of 22, 37 and 61 inches diameter and 36 inches stroke; steam supplied from two steel boilers (Scotch type) 12 feet 6 inches by 12 feet; steam starting and reversing gear.

FIRST LARGE STEAMER TO PASS THROUGH THE LOCKS.

It may be explained that the Mae did not pass through the enlarged St. Lawrence locks, which were not completed at the time she left for the coast. She was taken over the rapids and met with considerable bottom damage, which was made good in New York. The first of the steamers built especially for coast service under the new conditions which passed the enlarged canals was the Porto Rico, which made the trip from the lakes to the Atlantic at the very close of the 1899 season of navigation. The Porto Rico was also built by the Craig Ship Building Co. of Toledo and for the same owners, under the corporate name New York & Porto Rico Steamship Co. The Porto Rico is designed for mail, freight and passenger service around the island instead of for service between the ports of Ponce and New York, as was the case of the Mae. The Porto Rico, which is illustrated herewith, is 220 feet in length, 32 feet beam and 21 feet depth of hold, with 8 feet between decks. Her speed is 12 or 13 knots. She is finely fitted up in every particular for the carriage of freight and for about thirty first-class and twenty-five second-class passengers, having the best of auxiliary machinery, with electric lighting plant, etc.

To sum up the advantages of the new St. Lawrence canals from a ship building standpoint, it may first be noted that the few works in Canada engaged in building steel vessel will profit at once by orders for vessels suited to the trade that are to be engaged between Canadian ports, such as the fleet which it is said will be built as a part of the large project for grain elevators and warehouses at Montreal and Port Colborne, for which the W. J. Conners American syndicate recently secured grants. The Bertram Engine Works of Toronto and the Polson Iron Works, both Canadian ship building concerns, are expecting business on this score, and an enlargement of the works of the Collingwood Dry Dock Co., another Ontario concern, is also projected on the same account.



DESIGN OF BABCOCK & WILCOX WATER TUBE BOILERS BEING INSTALLED IN NINE LARGE LAKE FREIGHTERS. (See page 38.)

The English builders and those of the Clyde will also undoubtedly furnish some vessels to Canadian owners for this trade as they have begun to do already. Then there will be built in American yards on the lakes more canal-size vessels, that may be engaged on the lakes altogether, or in the trade to Montreal, as profits may direct, these American vessels being confined, of course, to the coasting regulations of the two countries as regards the ports between which they may be engaged. In view of treaty difficulties in the way, it will in all probability be some time before the ship builders of the lakes are given an opportunity to bid for the construction of even such naval vessels as could pass through the canals, but that they will be enabled to bid with considerable chance of success for revenue cutters, light-ships and other similar craft for oceanic service seems certain. The extent to which they will share in the award of contracts for the smaller class of vessels for coast service will, of course, be dependent to some extent upon conditions which will be of a constantly changing character. For instance, whenever the coast yards are crowded as they have been during the past year or so, more or less business is almost certain to come to the lakes. The fresh water plants are, of course, admirably equipped and economically administered, and they will very probably have in a close market some advantage in cost of material on account of being close to sources of supply.

BOILERS FOR BIG SHIPS.

DESIGN OF BABCOCK & WILCOX STEAM GENERATORS THAT ARE BEING INSTALLED IN NINE MODERN FREIGHTERS OF THE GREAT LAKES—REPORTS OF TESTS MADE BY UNITED STATES NAVY BUREAU OF STEAM ENGINEERING.

Nine very large ore carriers, all embodying the latest practice in the construction of freight steamers on the great lakes, and all under way at different works of the American Ship Building Co., are to be equipped with quadruple expansion engines and water tube boilers, the latter of Babcock & Wilcox design and manufacture. Four of these steamers are for the American Steamship Co., a corporation representing transportation interests of the American Steel & Wire Co., and the other five are for the Pittsburg Steamship Co., the organization that will manage Carnegie vessels on the lakes. The American Steel & Wire vessels will each carry nearly 9,000 net tons on 18½ feet draught. Their principal dimensions are 498 feet over all, 52 feet beam and 30 feet depth, and their engines will have cylinders of 16½, 25, 38½ and 60 inches with 40 inches stroke. The Carnegie steamers will each carry full 8,000 net tons on the same draught. Their dimensions are 474 feet over all, 50 feet beam and 28½ feet depth, and their engines will have cylinders of 18, 26¾, 41 and 63 inches diameter with 42 inches stroke.

A drawing presented herewith shows the general arrangement of Babcock & Wilcox water tube boilers for these nine steamers. These boilers will contain the new style of baffling, which causes the gases to pass three times over the tubes before allowing them to enter the uptakes. The traveling of the hot gas in contact with the heating surface is therefore between 16 and 18 feet—much longer than is obtained by any other type of water tube boiler, and about twice as much as in the ordinary Scotch or return tubular boiler.

In connection with reference to the boiler equipment of these up-to-date lake freighters, it will be of interest to refer again to that part of the last annual report of the engineer-in-chief of the United States navy (Rear Admiral Geo. W. Melville), which deals so interestingly with the water tube boiler question. This report deals at length with four tests made in April last of a boiler of the Babcock & Wilcox kind for the U. S. S. Alert. The Alert now has two of these boilers. In addition to the new style of baffling above referred to, there was also in the boiler that was tested an air heating device, which was improvised in order to try its efficacy, "but it was concluded," the report says, "that the comparatively low temperature of the uptake gases during all the tests, both with and without the air heater in use, seems to indicate that the air heater is not a necessity in combination with a boiler of the design under consideration, and cannot be considered a desirable adjunct, except possibly when working at very high rates of combustion."

The lower row of tubes immediately over the furnace in the Alert boiler are 4 inches in diameter, and above each of these tubes are seven groups having four 2-inch tubes in each group. Thus an element consists of one 4-inch tube and twenty-eight 2-inch tubes. The sides of the boiler are formed by tubes, which lead into forged steel boxes of square section, the latter constituting the corners of the boiler. The lower tubes, opposite the furnace, are of square section. There is the usual longitudinal steam drum connecting the front and back headers. The diameter of this drum is 42 inches. The floor space occupied was 11 feet by 8 feet 9 inches; the height was about 10 feet 9 inches. The total number of 2-inch tubes is 364, the exposed length of each tube being 9 feet 2 inches. There are also eighteen 4-inch tubes 9 feet 2 inches long, and fourteen 4-inch tubes 7 feet 11 inches long. The total heating surface, including boxes and drum, is 2125 square feet. The length of the grate is 6 feet 4 inches, and surface 48 square feet. The total weight of the boiler, without water, was 46,110 pounds, of which the pressure parts contributed 27,352 pounds. With water at steaming level, the weight was 53,770 pounds, the water being at boiling point at 200 pounds pressure.

The first of the four tests was with cold air and closed ashpit, a blower being used, aided by a steam jet in the chimney. The combustion of coal was at the maximum intended to be attained in practice. The second test was with open ashpit, but with steam jet giving a partial vacuum equal to about 0.45 inch of water, this being the equivalent of the natural draft that would be given by the funnel of the ship. The third trial was made with heated air. On these three trials Cumberland coal of good quality, with about 7.39 per cent. of ash and 4 per cent. of surface moisture, was used. A fourth trial, with cold air, and burning anthracite coal, was made. Experiments were also made to test the time needed for raising steam. From these it would appear that, starting with all cold, in 11 minutes steam began to appear; in 13½ minutes, 5 pounds pressure was registered on the gauge; in 16 minutes 25 pounds; and in 18¾ minutes 50 pounds. At 20 minutes there was 65 pounds pressure, and the blower was turned on; in 21¾ minutes, 100 pounds; in 23¾ minutes, 150 pounds; and in 26¾ minutes, 225 pounds; at which pressure the safety valve lifted and the blower was stopped.

Referring to these results Engineering of London says: "This record of steam raising is certainly excellent, if not remarkable; but everything appears to have been done to get the pressure up quickly, kerosene being thrown on the fire after it was lit, and soft coal being used. In some tests we have ourselves made with the Babcock & Wilcox boiler on board a North sea steamer, a pressure of 50 pounds was reached a few seconds after 20 minutes after smoke first emerged from the funnel, starting with all cold. The interesting point with these small tube boilers is to note fluctuations in steam pressure on opening out the engines; a detail in practice that has been fatal to more than one water tube boiler in the past. This naturally is not referred to in the report from the United States navy. In our own experience with the Babcock & Wilcox boiler, on the voyage of the ship referred to, we found the action satisfactory in this respect; for though there were naturally quicker fluctuations in pressure than there would be with an ordinary return tube boiler, these did not amount to anything serious, such as would cause inconvenience to the engineers in obeying any orders from the bridge. When the ship got her anchor in the Humber, the pressure was 170 pounds. On the engines being started ahead, this fell quickly to 160 pounds, after which there was a gradual recovery; until in about ten minutes, the standard working pressure of 205 pounds to the square inch was shown, the gauge remaining steady at this during ordinary working throughout the voyage."

Returning to the United States navy trials, it may be noted that the first test made was of six hours' duration. As stated, both a steam jet and a mechanical blower were used to urge combustion in the furnace. This combination was adopted partly because the steam jet was not powerful enough to give the required draft, and also for the reason that the blower delivering into the closed ashpit would have been likely to have caused flame to have come out of the furnace doors while coaling. The tendency of the steam jet to create a vacuum in the furnace about balanced the power of the fan to cause a plenum, and atmospheric pressure was thus reached. There is printed herewith data extracted from the report of the four trials.

REPORT OF TESTS OF BABCOCK & WILCOX WATER TUBE BOILER MADE BY BUREAU OF STEAM ENGINEERING, UNITED STATES NAVY.

	Test No. 1.	Test No. 2.	Test No. 3.	Test No. 4.
Duration of test	6 hours.	10.1 hours.	6 hours.	6 hours.
Dry coal consumed	13.073 lbs.	9,634 lbs.	12.063 lbs.	8.300 lbs.
Refuse	967 lbs.	846 lbs.	1,267 lbs.	1,023 lbs.
Water fed to boiler	104.476 lbs.	90.005 lbs.	102.357 lbs.	76.046 lbs.
Temperature of feed	94.5° Fah.	110° Fah.	91.5° Fah.	111° Fah.
Temperature of uptake	619° Fah.	445° Fah.	572.7° Fah.	521° Fah.
Temperature of fire room	71° Fah.	66.3° Fah.	96.1° Fah.	83.75° Fah.
Temperature of air entering heater	.....	.....	84.1	.....
Pressure (absolute)	234 lbs.	143.4 lbs.	234.6 lbs.	232.81 lbs.
Air pressure in ashpit, in. of water	+0.53 in.	.....	+0.51 in.	+0.55 in.
Air pressure in furnace, in. of water	—0.43 in.	—0.14 in.	—0.24 in.	—0.07 in.
Air pressure in chimney, in. of water	—1.43 in.	—0.43 in.	—1.41 in.	—0.61 in.
Coal per hour per square foot of grate	45.3 lbs.	19.88 lbs.	41.88 lbs.	28.82 lbs.
Coal per hour per square foot of heating surface	1.03 lbs.	0.449 lbs.	0.95 lbs.	0.65 lbs.
Apparent evaporation from feed temperature at steam pressure noted per pound coal	7.99 lbs.	9.34 lbs.	8.49 lbs.	9.16 lbs.
Evaporation from and at 212° per pound of coal	9.42 lbs.	10.76 lbs.	10.04 lbs.	10.66 lbs.

AVERAGES OF ANALYSES OF FLUE GASES FOR ABOVE FOUR TRIALS.

	CO. Per cent.	O. Per cent.	CO. Per cent.
Test No. 1	10.7	7.8	.5
Test No. 2	10.9	7.7	.02
Test No. 3	10.9	8.1	.06
Test No. 4	11.1	8.7	.00

It is announced from the navy department that a strong effort will be made to secure the passage of legislation in congress providing for the construction of dry docks of the largest size at Havana, in the Philippines and some point in Puerto Rico. Under existing conditions all the vessels in the Philippines are compelled to proceed to Hong Kong for repairs. If the proposed bill goes through, it is probable that a recommendation will be submitted to the effect that the dock in the Philippines be located at Subig bay. This is an excellent natural harbor and is only sixty miles from Manila.

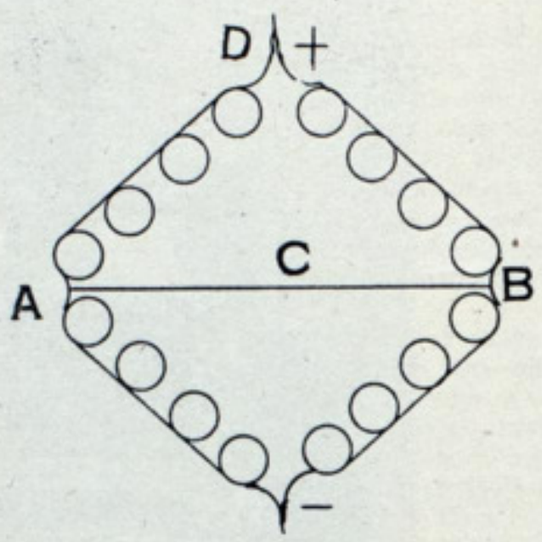
Central Passenger Association mileage tickets.—The Nickel Plate road has become a member of the mileage ticket bureau of the Central Passenger Association and all mileage tickets properly issued by any line, a member of that bureau, are valid for use on that road on and after Feb. 10, in the same manner as on other roads, members of that bureau. 17

ELECTRICAL STEERING GEAR FOR SHIPS.

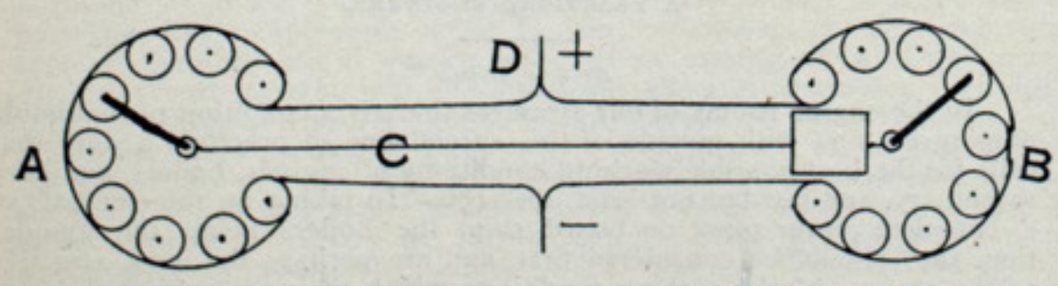
Interest in the struggle for increase of electric drive aboard vessels of war has been materially increased by the announcement that four Russian war ships, two building in Russia and two at the works of the Cramps, Philadelphia, are to be fitted with electric steering gears. Tests of the new apparatus at the works of the Electro-Dynamic Co., Philadelphia, have attracted attention from engineers of the Russian government, as well as officers of our own navy, and in fact from all parts of the world. That the apparatus has successfully withstood the criticisms of experts and the working tests, makes it of great interest to the average reader and we are pleased to offer in this issue diagrams of the machinery and wiring and a simple statement of how it works.

There are many points about the system (to be understood by the technical man from the diagrams) which we will not enter into, as they would only weary those who are not electricians.

The system is that old device for measuring resistances, known as the Wheatstone bridge. For the benefit of the uninitiated it may be explained that if we make two branches, A and B, in a wire, through which an electric current is flowing, the current will flow equally through each, if the resistances are the same. Wheatstone ran a wire C across the arc AB and placed on C a coil surrounding a compass needle. When the corresponding portion of the resistances A and B were unequal, current would flow through C and divert the needle. If now the connection of C to either A or B be shifted along the wire until the corresponding portions of A and B are equal, no current will flow in C. If the contacts be made still further along, current will flow in the opposite direction to that passing at first. This system is very generally used in electrical measuring instruments today and is generally accepted as sound by electricians.



If we arrange these two resistances in circles, so that they may be easily altered by turning a couple of radial arms, (Fig. 2) we have merely



altered the shape of our bridge and have not affected its working. They may be at opposite ends of the ship, or anywhere the wires connecting them may be run. If on the wire C we place a motor capable of running either way, and connect the shaft by mechanical means to rotate the sweep B, current flowing through C in either direction will operate the motor until the contact on B corresponds to that on A when no current will flow through C and the motor will stop. Any change in A will be followed by a similar change in B. This is the principle used by the Electro-Dynamic Co., and it will be seen that it is simple, scientific and exact.

Now for the application. In the diagram shown of the wiring of the Gromoboy we have a complete adaptation of the principle just explained. A is the rudder indicator and T, above the rudder, is the varying resistance, which is fed with current from the electric lighting mains of the ship. The indicators are Weston volt-meters adapted to use very small currents and remounted by the Electro-Dynamic Co. in brass boxes with special scales. The scales are graduated so that the index moves one degree on the scale for each degree of arc of the rudder and the two at all times coincide. There may be any desirable number of these indicators. In the present case there are five. The four lower ones are shown as strands of a cable, because that is the way they are run in practice, while the upper one is open, so that the wiring may be readily traced by the reader.

The resistance S at the rudder end and resistance B in the steering column, both taking current from the lighting mains of the ship, form the application of the principle of the Wheatstone bridge, while motor N, dynamo F, and exciter E, are all operated by the middle or balance wire of the system. In connection with the sweep mounted on the rudder head they operate to equalize the flow of current as previously explained. Motor N′ is a duplicate of N and is only used in case N is thrown out of action, disabled in action or shut down for repairs. G is a motor driven continuously by current from the lighting mains and rotating the armatures of dynamo F and exciter E. Unless the fields of E and F are excited their armatures are doing no work and their mere revolution is a very small task on the lighting circuit.

One end of the field of exciter E is wired to the sweep at the rudder head S; the other passes through the switch D, and forms the centre wire running to the steering column B. It is shown open at the switch under the steering wheel C. This is the middle or balance wire of the system and the other two wires of the steering column may be traced through the switch to their respective resistances at either end.

The switch D has five stations of three poles each, but only one switch bar of three poles, so that only one station can be used at a time, the others being merely duplicates to be used as circumstances may require. The reader will here notice that while all five indicators are connected and working constantly, the wires from all steering columns end at the switch D, so that only one can be used at a time, thus preventing any possibility of accident from two persons attempting to steer from different stations and in different directions. This switch is placed where a competent person may have charge of it, below the protective deck, naturally in the engine or dynamo room. Placing the current on any station lights a lamp which illuminates the scale of that indicator. Suppose we desire to use the steering column. We first close the switch on the balance wire shown open under resistance B. We now vary the position of the sweep on resistance B, by means of the handwheel C; this sets the current flowing through the balance wire, excites fields E, which becomes a dynamo and sends its current into fields F, a much larger and stronger machine. F immediately generates current and transmits it to motor N, whose armature is geared to the right and left screw which operates the rudder arms until resistance S balances that of B, when action stops. The sweep of T being mounted on the same shaft as that of S (though not so shown in the drawing) immediately shows at the five indicators, A, the new position of the rudder.

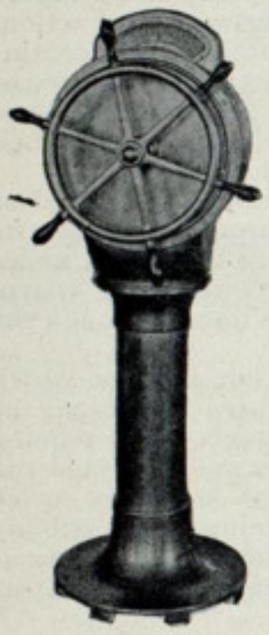
During this time the motor G has had to do work proportioned to the power required of E and F in addition to its task of merely rotating the armatures. When current ceases to flow through the balance wire this power is no longer required and matters resume their normal position. The object of using E, instead of wiring direct to F, is in order to be able to use very small currents in the steering columns. E and F are merely multipliers, while E is much smaller in proportion than is indicated in the drawing. Just here we may note some peculiarities of the system. The speed of a motor depends upon the voltage. If we turn the wheel C rapidly we will throw a quantity of current upon fields E, saturating them

THE PFATISCHER ELECTRICAL STEERING GEAR.

A—Rudder indicator.
B—Steering rheostat.
C—Steering wheel.
D—Three-pole, five-way switch.
E—Multiplying exciter.
F—Dynamo.
G—Motor.
H—Starting box.
K—Motor.
L—Starting box.
M—Dynamo.
N N—Steering motors.
Q—Motor for operating steam valve to engine.
R—Steam engine.
S—Balancing resistance.
T—Rudder indicator transmitter.
U—Ammeter.
V—Voltmeter.
X—Carpenter rheostat.

and delivering a high voltage to F. It in turn sends a high voltage current to N and the motor moves quickly, turning the rudder quickly. If we turn the hand wheel slowly we will start action slowly in E, and F and N will move slowly. It was no small task to design motors and dynamos capable of working in this way, constantly reversing under varying currents, but space forbids dwelling upon this point. It is one of those things that look simple after someone has shown us how to do it. The motor is reversed from full speed in one direction to full speed in the other in about five seconds. K, M and Q are a similar system, used to control the steam steering engine R, to be used only when both motors N and N' have been put out of action.

It will be seen that all circuits are continuously closed, consequently there is no sparking. There are no adjustments to be made after the machine has been set. The dynamos may be grouped in the engine room. Extra leads of wire may be run so as to preclude the possibility of destroying electrical communication between the dynamos and the steering motor. The system is silent, positive, and does not heat up the ship. Wires may be run through watertight bulkheads with much greater facility than steam pipes. The control is accomplished by means of very small currents, and can be established from any number of stations on the ship, while the working currents are in short and well protected mains away from any possible chances of affecting the navigating instruments of the ship. The only constant expenditure of energy is that used for rotating the armatures of E and F through dead fields. This is much less than the condensation of steam in the ordinary steering engine, which usually has its valves set at three-quarters stroke and its ports kept open to blow out the constantly forming condensation and keep the cylinders warm while the engine is idle. It will be seen, therefore, that the electrical system offers important advantages in its flexibility, safety, coolness, silence and low cost of operation.

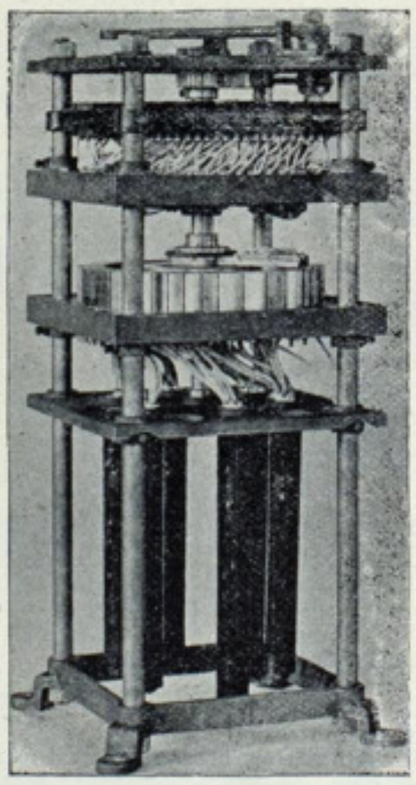


STEERING COLUMN.

There are also presented herewith photographs of the steering column and rudder and indicator resistances. The steering column is of brass. The resistances are wound on porcelain, cemented in iron tubes, plugged at the bottom to be watertight They are mounted in the hollow column, which is ventilated to carry off any heat. They are wired to bars of a circular set of contacts placed vertically in the hood and a central sweep is operated by the hand wheel, which is back geared so that nine turns of the hand wheel are required to swing the rudder from hard over to hard over, the arc of the rudder being 35 degrees each side of the midship line. An index connected with the gearing extends through the casing on top of the hood, so that the sweep of the rheostat may be set to any angle. The indicator is placed at the rear of the hood and its scale projects above it as shown. The rheostat is divided as follows: The first six degrees each side of the midship line are in one degree steps; the next fourteen are in two degree steps; the next fifteen are in three degree steps; a dead segment completes the circle, so that if the sweep should be thrown past the stops, current would be cut out and no injury result. The rudder indicators have single degree steps over the 70 degrees of arc.

The second photo shows the two rheostats at the rudder. It is of similar construction to that already described, but is larger, is placed vertically and is left open for ready inspection, there being no occasion for circumscribing the space it occupies, while better ventilation is thus secured. Any further information will be supplied by the manufacturers, the Electro-Dynamic Co., 224 Ionic street, Philadelphia, Pa.

It is hoped that the Review will be enabled to present later on further reports of tests of this device from the Philadelphia works.

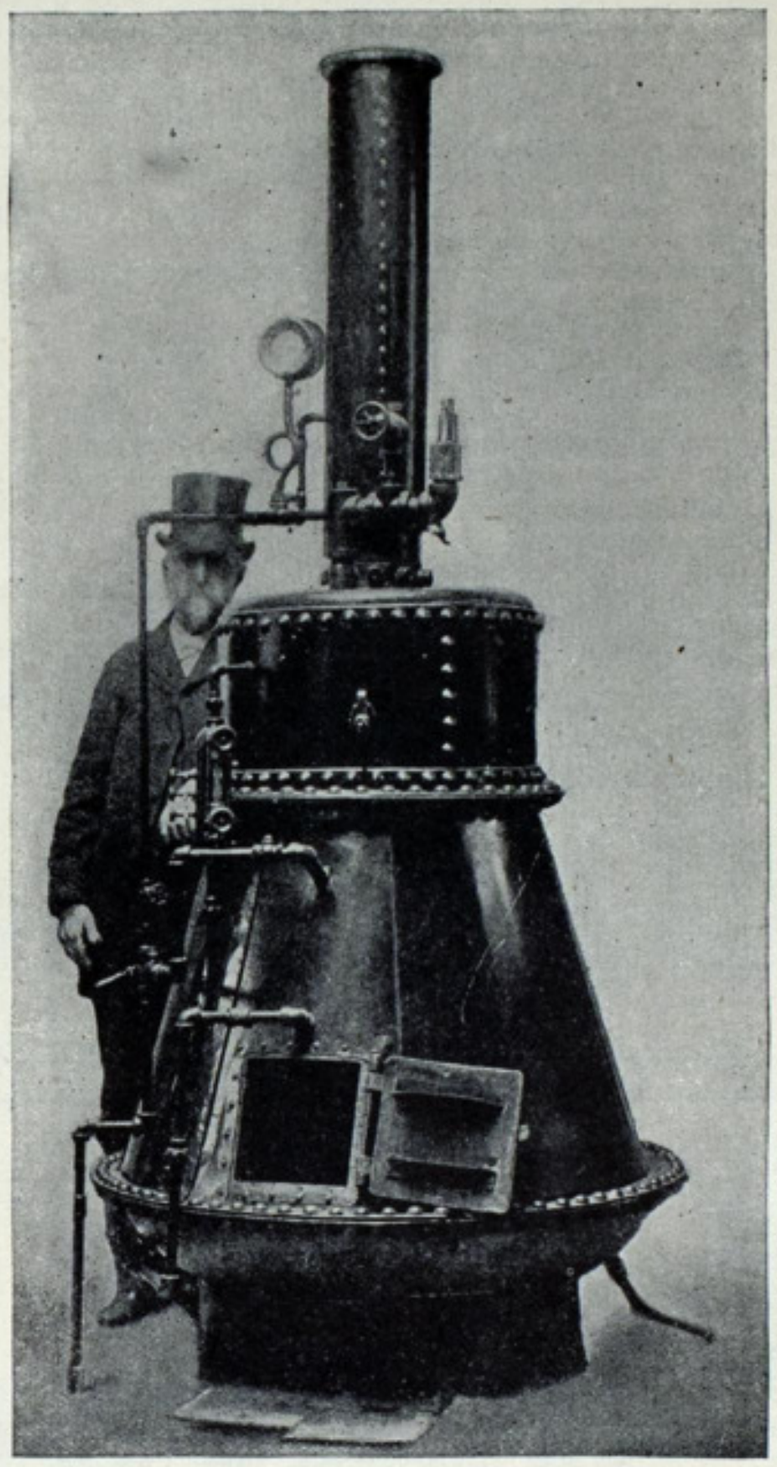


RUDDER COLUMN.

WATSON RADIAL WATER TUBE BOILER.

I make a practical, common sense water tube boiler in small powers for marine or stationary work that will give good satisfaction with ordinary decent treatment. I warrant it to do the work I say it will, and refund the money paid for any fault in the boiler. For marine use it is unsurpassed, as the greatest weight is dead on the bottom of the boat. It is accessible all over for cleaning and repair and has neither stay-bolts, braces, fire bricks, or castings under pressure in it. It is all steel plate and solid drawn steel tubes (no "lap welded, semi-steel tubes" used), they are expanded in, and cannot strip or break off in the holes in a bad place. My boilers steam furiously on very small grate surface and will keep to gauge pressure all day when decently fired. The usual pressure is 200 pounds per square inch, but up to 500 per square inch can be had if needed and made for it. The engraving shows the general appearance of my boiler, with the exception that this is an old style made 2 years ago. Since then I have introduced great improvements. The bottom joints are now riveted in lieu of being bolted, and the dome gasket is metallic. Hand holes are cut in the bottom, through which the tubes can be re-expanded or cut out if necessary, and all sediment can be easily seen and removed. Since no fire ever touches the water bottom, sediment coming down the tubes remains soft, and never bakes on. For the same reason dirty water does not hurt this boiler in the least. I have put a bucket full of solid loam on the upper crown sheet and in five minutes it was all in the water bottom, having come down the tubes.

These boilers are half the weight and double the efficiency of fire tube, shell boilers. They readily give one horse power upon 5 square feet heating surface per horse power, where fire tube boilers require 10 square feet, and many patrons upon receiving them have decided very promptly (before trying them) that they were much too small. The ten horse power boiler is not larger than a parlor stove, and weighs 600 pounds only; other sizes in proportion. It is not possible to blow a tube



OLD STYLE, 20 HORSE POWER, NATURAL-DRAFT, SIMPLE-ENGINE BOILER; WITH COMPOUND ENGINE, 30 HORSE POWER.

out of these boilers. As much as 275 pounds per square inch has been put on a boiler with twenty loose tubes in it, but not one tube was displaced.

My boilers are in use all over the country for marine and stationary work, and are made 10 to 100 horse power only at present for want of shop room, but I can make up to 320 horse power. Tell me what you want to drive (everything that takes live steam from the boiler) and I will sell you a boiler that will do the work. Give size of cylinder, stroke or piston, pressure and revolutions per minute; natural draft is assumed unless otherwise specified. I do not keep boilers in stock, but make every one to special order. Send for my illustrated catalogue, giving full details of construction.

EGBERT P. WATSON,
Madison Ave. Shops. Elizabeth, N. J.

ENGINE ROOM PRACTICE.

WITH ESPECIAL REFERENCE TO THE CARE OF BOILERS—NOTES FROM A PRACTICAL ENGINEER.

BY E P. GOULD.*

In the engine rooms of our steamers there is a condition of maximum duty rarely met with outside of this special line of practice; a duty that calls for the best possible working conditions of engines, boilers, auxiliary machinery, and last but not least, the crew. In taking up the elements of a complete power plant on board ship, the boilers being the foundation, they should be considered first, and are perhaps the most sensitive to the abuse and the varying conditions which they are subjected to, in and out of commission. As regards the care of a boiler in commission, the heating surfaces are and should be the first consideration. It is the important duty of the chief engineer to see that this surface, both the fire and water sides of the sheets, are clean. The dust, soot and ash should, on all blow-off days, be swept from the furnace, combustion chamber and tubes, in addition to the regular tube scraping that usually comprises all the attention paid to the fire surface of a boiler on this occasion. The

*Mr. Gould is in charge of the marine department of the Dearborn Drug & Chemical Works, Chicago.

water side of the heating surface has been a problem for many years. The incrustation and corrosion or electrolysis has been the element responsible for more trouble for the chief engineer than any other condition about his plant. This is due to the chemical action taking place in the boiler, and also the fact that chemistry as pertains to this particular branch has been almost totally overlooked or was never introduced in the mechanical education of the engineer.

It would certainly be an advantage for the engineer to know the chemical composition of water (H_2 O), which means, two parts hydrogen and one part oxygen; also water being the greatest solvent known, absorbs about all it comes in contact with of a vegetable and mineral nature, the later in particular. Hence, the action of evaporating the water into steam leaves behind this solid matter to become impinged on the heating surface in its precipitation to the cool portion of the boiler where it may find some repose. A boiler is therefore the best mechanical separator known. When a water contains above a certain amount of sodium and potassium salts it is sure to produce galvanic action (corrosion) in a form more or less mild or strong. Now then, when you take into careful consideration this fact, you will readily see that to use a soda in any of its many forms, you will have a more intensified action in the same direction instead of obliterating the same as you have previously been led to believe; also, do not forget that nine-tenths of all preparations marketed as boiler compounds depend upon soda in some form for their reaction and are usually marketed by people who make no pretense of aiming at the chemical conditions as they really exist. It has been proven in the last fourteen years by a laboratory devoted entirely to steam engineering and steam economy and an authority in that exclusive line, that a vegetable antidote is the only practical method to employ as a scale solvent and perfect preventive for the condition of galvanic action; also that different waters require different treatment, due to their difference in mineral composition.

From a laboratory experience extending over a number of years on water analysis, a very prominent chemist tells me that he has never analyzed a water that did not require treatment. He says some waters require only a small expenditure to successfully obtain desired results while he sometimes finds a water that cannot be used at all in a steam boiler. He says further that when a water will not cause incrustation, it is sure to cause galvanic action (corrosion) and vice versa. This is the reason that surface condensing plants aboard ship require a proper antidotal reagent to satisfy the water which becomes too pure and attacks the boiler, causing pitting, grooving, corrosion, etc.

There is still another trouble that has confronted the chief engineer, due to the progress of modern ship building. It is in the form of electrolysis and is making itself felt in a pronounced way in this manner: A steel ship with electric lighting plant aboard may have had advantage of the best practice in installing the plant and as to distribution and insulation of wires, but there will be a leakage of current that not only attacks the ship itself, but finds its way to the boilers and condensers (surface condensers), because they are the most sensitive to the galvanic action around them. The boilers readily convert themselves into galvanic action, and in this way the water becomes too pure in many cases and forms a ready connection as an electrolyte, conducting the currents from the negative pole, which in this case is represented by all brass fittings, such as valves, etc., due to the copper they contain; while the tubes, shells and furnaces are converted into a positive element, in the absence of a more appropriate metal and from the fact that the positive pole is always antagonized and destroyed (as zinc in a battery) these same tubes, shells and furnaces are pitted and grooved, and a state of corrosion is in full progress of destruction, intensified by the leakage of the electric light plant aboard and the possible use of soda for a boiler compound. This state of affairs also exists in every electric light and power plant ashore. It may occur to you that you have been shipmates with just such conditions in a wooden vessel and without electricity aboard. That is accounted for in this way: Using a soda in the boiler as a compound, you form a battery solution in itself that carries on the elements of electrolysis perfectly, as long as there is a fire in the furnace and water in the boiler; also all the distribution pipes under pressure of steam or water, suffer with the boiler.

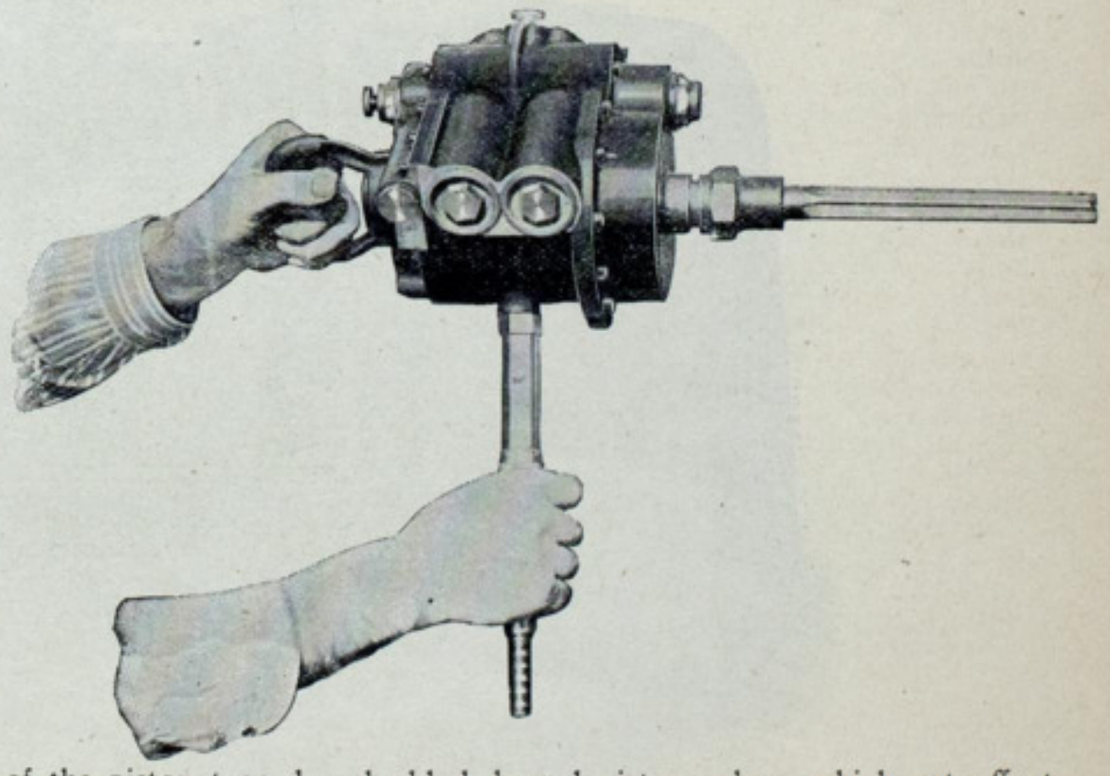
I am therefore prompted again to say to engineers, do not use a soda in any form. What you want is a vegetable antidote for the feed water used, and the fact goes without saying, that in order to obtain the proper remedy you will have to have the water analyzed. The fact is, waters as a rule contain a percentage of sodium and potassium salts that in itself is sufficient to cause the above conditions in a more or less mild form, so you can see that if you use a soda at all you are paying for your own destruction.

Now as regards the use of oil in boilers. It is an established fact that even one per cent of oil in a boiler is just one per cent. too much. Take, for instance, kerosene oil, which evaporates freely at a temperature of 135°F. Water does not evaporate or boil until 212°F. is reached. So, you see, the system is not consistent. In other words, if you introduce kerosene oil into a boiler with a pressure of 100 pounds of steam and a corresponding temperature of 338°F., your oil evaporates under this very high temperature just as quickly as it enters, passing off with the steam throughout the system, with the disastrous effect of destroying the lubrication, gaskets and packing and causing leakage of joints regardless of the danger that accompanies its use. Frequently an oil is put on the market for boiler purposes under another name and so disguised in appearance that at first glance and thought it does not occur to you that it is kerosene, and to carry out the deception a price will be tacked to it that apparently puts that question past all doubt. But stop and say to yourself, this piece of goods must be investigated, and do not use it until you are in a position to judge whether or not it is what you want. "Be sure you are right, then go ahead." This should be the motto universally adopted in the engine room.

In the rapid development of the water tube boiler for marine service, I sometimes wonder why it never occurs to the manufacturer and chief engineer that the conditions under which this type of boiler should be installed have never been given careful consideration (I am speaking of fresh water service only). A manufacturer installs his boiler on board ship and it is, of course, understood that the improvement means less weight, less space, greater evaporating power and higher steam on the one hand, and more cargo, more power, greater economy and greater safety on the other. All these elements are of the utmost importance to the ship owner and all others interested, and yet they are not giving this favored type of generator a chance to do itself justice and approach the endurance of the shell boilers, because they insist on using a jet condenser (I mean on fresh water) instead of a surface condenser. From my experience with water tube boilers afloat, I am willing to go on record as saying that this one error has been responsible for retarding the progress of the water tube boiler on the great lakes. I would quite as readily cast the value of a vacuum to the dogs and place my boilers in connection with engines exhausting overboard with all their maximum duty as to place them in connection with a jet condenser and expect to get my money's worth on the combined results. This applies to shell boilers as well as water tube, and fresh and salt water equally. May I ask what reason or good practice there is in combining the double duties of a generator and a separator in one element, when the generator is the sole object aimed at? A water tube boiler is more sensitive to the use and abuse of navigation than any other type, and incrustation and galvanic action in it shows up like a mountain, on account of the water being subdivided into smaller elements and the circulation more contracted, but with a surface condenser using the condensation for feed water in connection with oil separator and the proper vegetable boiler compound to prevent galvanic action and incrustation, you will find the water tube boiler will give a good account of itself and in my opinion live as long, if not longer, than the shell boiler under high pressure. I am prompted to refer to an accident that happened to my boat a few years ago, feeling it will not be out of place in this article. As we had but a single crew we did not run nights, so on this particular night we tied up to the dock as usual. My orders were for steam at 4 a. m. The weather was fine, so we sat up on deck until 10:30 p. m. I got up at 3:30 a. m., noticed it was raining hard and called the fireman. Just as I stepped into the engine room I went over my shoe tops in water. In haste I rushed for the syphons and found I had no steam. I looked at water glass, over three gauges. I opened the furnace door and found the fire all out but the water was coming down from the tubes in torrents. I was not frightened, only startled. I went to the companion way and looked up overhead and there before my eyes was a large spout from a flat roof building pouring its contents down my smoke stacks. It did not take me long to pipe all hands and hustle that boat out of the way. I never got steam so rapidly in my life, and it seemed to me that the boiler was trying to make up for lost time for a week of Sundays after that. It certainly is an ill wind that blows no good. I have used the hose frequently since, but always prepared for it.

STANDARD PNEUMATIC TOOLS.

The accompanying illustration shows a new addition to the already extensive line of pneumatic tools manufactured by the Standard Pneumatic Tool Co. of Chicago. It is called the "Little Giant" pneumatic, reversible, flue-rolling, reaming and tapping machine No. 11, and is designed especially for marine work. It is geared to run at a high rate of speed, and is controlled and reversed by simply turning the grip handle to right or left (no gears being used to accomplish this), and is



of the piston type, has double-balanced piston valves, which cut off at five-eighths of full stroke, and is very economical in the use of air. It will ream and tap up to 1¾ inches, and is very easily handled and operated, being light in weight and very compact. It will roll a 4-inch flue and is made entirely of steel. This machine has been tested in a number of large ship building establishments, and the results have been very satisfactory. The Standard Pneumatic Tool Co. will send the machine anywhere on trial, and pay express charges both ways if it fails to fulfill requirements. They also manufacture a full line of pneumatic drills, boring machines, hammers and motor chain hoists and will send them to any party desirous of testing their efficiency under the same conditions.

A circular letter from Mr. James Howden of Glasgow, inventor of the Howden system of hot draft, is as follows: "I have the pleasure of informing you that on Jan. 1, 1900, I assumed as a partner my nephew, Mr. James Howden Hume, who for many years has been associated with me in conducting my business of James Howden & Co., and on whom, during recent years, the greater share of the management has devolved. The business will in future be carried on by both of us under the old name."

BENDING AND STRAIGHTENING MACHINE.

The machine illustrated on this page is designed for bending and straightening ship frames, angles, channels, rails, beams, etc., and is especially useful in structural iron work. The dies are arranged to be placed one upon the plunger, the other on the bed, and can be reversed so that material can be bent to a complete circle. The plunger has a wedge for changing the position of the plunger die. This wedge is operated by a hand wheel and screw and can be adjusted very quickly. This machine has a capacity to bend or straighten from the smallest angle to a 15-inch beam. It is made by the Cleveland Punch & Shear Works Co., Hamilton street, Cleveland.

CAPT. JOHN W. GILLMAN.

Chicago, Ill., Feb. 6—Capt. John W. Gillman, superintendent of the Goodrich Transportation Co. of Chicago, and one of the most widely and favorably known men on the great lakes, died very suddenly of paralysis of the heart on a Chicago & Northwestern train as it approached Manitowoc, Wis., about 9 p. m., on the 31st ult. Capt. Gillman had left Chicago at 5 o'clock in apparently his usual good health, no one suspecting that he was at all ill, as he had been as bright and cheerful as usual. He was taken ill while conversing with a friend, Mr. Hamilton of Two Rivers, and expired almost immediately and apparently painlessly.

Capt. Gillman was born in Ireland, March 31, 1837, and came to this country when only nine years old. His home was in the south, and when the war broke out he enlisted in the confederate army and saw a good deal of fighting, mostly in Virginia, in both the infantry and cavalry arms of the service, and was severely wounded in one engagement. He came to Chicago in 1866 and started as a wheelsman on one of the Goodrich line boats, and has been with that company ever since, having been on all the boats in some capacity, and captain of most of them, finally being appointed superintendent in 1891 on the retirement of Capt. Butlin.

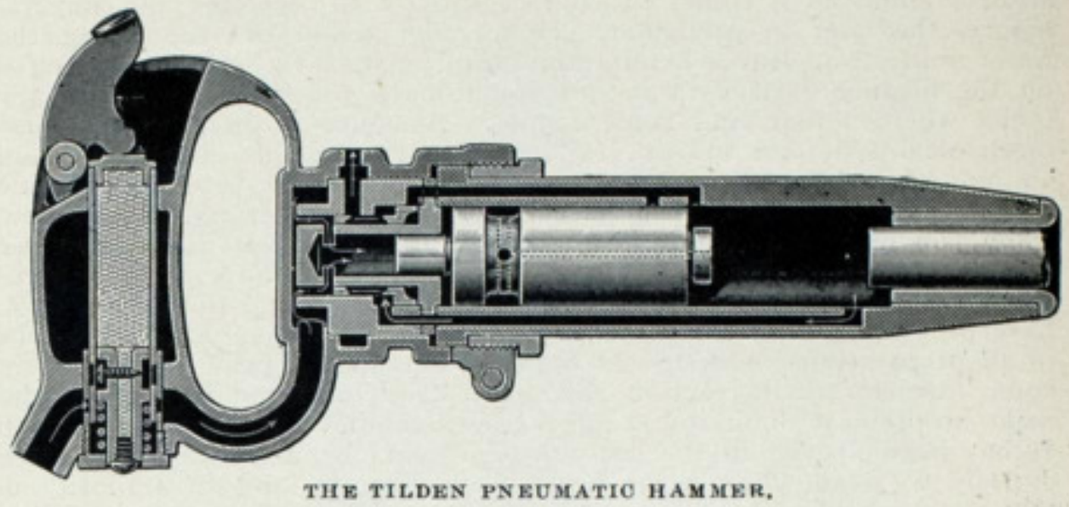
No man knew Lake Michigan and Green Bay better than Capt. Gillman, and there never was a more careful and courageous sailor or more popular steamboat commander on the lakes. He commanded the De Pere, City of Ludington, Menominee, City of Racine and Virginia, and in fact nearly all the principal boats of the line. When the iron steamer Wisconsin was caught in the ice in 1884, it was Capt. Gillman and his crew from the city of Ludington who loaded a ship's boat with supplies and dragged it over the ice for several miles to the relief of the imprisoned vessel and famished crew. He was beloved as well as respected by all who knew him. He was at all times courteous and made hosts of friends who feel his death a personal loss. Although a strict disciplinarian with quiet and becoming dignity, he was also generous almost to a fault, as many can testify who have appealed to him for assistance and were helped in a quiet unostentatious way.

When in command of a vessel he relied entirely on his own judgment in going out in doubtful or bad weather, and his cool courage, coupled with ability, often carried him through when other masters remained in port for more favorable weather. It was these characteristics that earned for him the sobriquet of "Hells-fire Jack," a title that many were surprised at on meeting such a modest, unassuming man. His remains were interred in Graceland cemetery on Sunday at 3 o'clock after service at the chapel there, and were attended to the grave by hundreds of mourners, among them all the officials of the Goodrich company, including the agents from every port and most of the Chicago employes. Several former employes came a long distance to be present, and there was a special train from Manitowoc. There were many choice designs of the richest flowers at the grave, and it has been proposed among Goodrich employes to erect a monument in Graceland to the memory of the deceased.

W. J.W.

TILDEN PNEUMATIC TOOLS.

The manufacture of this hammer will be commenced immediately by the Tilden Pneumatic Tool Co. of 1209 Monadnock block, Chicago, under the management of B. E. Tilden and C. J. Fellows. We present herewith a sectional view of this new tool, a thorough study of which will give the reader an idea of its construction and operation. Starting with the parts in the position as illustrated, the compressed air from the main chamber passes through parts into the valve block chamber to press upon the upper end extension of the impact piston, and acting against the decreased area thereof imparts a light initial movement to the piston, which from practical experience has been found to be very efficient in reducing the amount of jar or vibration that is usual in the previous type of hammer.

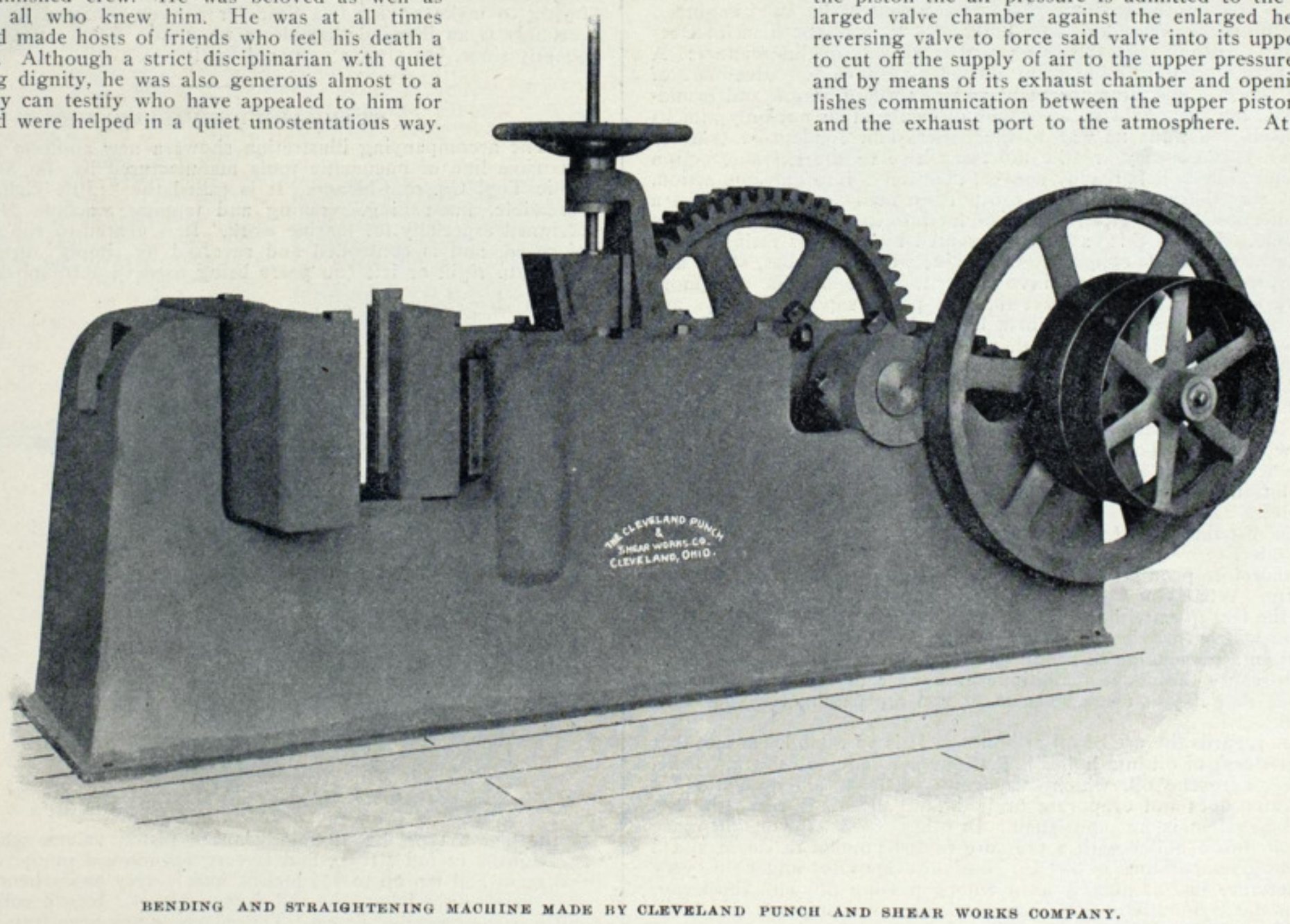


THE TILDEN PNEUMATIC HAMMER.

With the end extension of the piston forced out of the chamber of the valve block, the full area of the piston is exposed to the compressed air and an active and forcible downward movement of the piston takes place. In such downward movement of the piston the pressure of the air continues until the annular chamber of the piston registers the first port or passage on the opposite side of cylinder, after which the remainder of the active stroke of the piston is dependent upon its momentum. Upon the registering of the port referred to with the annular passage of the piston the air pressure is admitted to the lower enlarged valve chamber against the enlarged head of the reversing valve to force said valve into its upper position to cut off the supply of air to the upper pressure chamber, and by means of its exhaust chamber and openings establishes communication between the upper piston chamber and the exhaust port to the atmosphere. At the same time the air passes through the restricted port in the piston into the lower piston chamber to cause a comparatively slow return or upward movement of the piston.

With the return of the piston to its upper position, the lower end of the port is uncovered and communication between the same and the lower piston chamber is established, which allows pressure in the lower valve chamber to exhaust therefrom, and permit the constant air pressure upon the upper reduced end of the valve to again force the same into its lower position, to recommence a fresh cycle of the operation just described.

The manufacturers claim that this hammer has a great advantage over all other makes, owing to the fact that it possesses no recoil. This has been the great difficulty, hitherto, with tools of this kind, the recoil or vibration being so pronounced that the operator was unable to use them steadily. With the new and improved hammer, however, the operator



BENDING AND STRAIGHTENING MACHINE MADE BY CLEVELAND PUNCH AND SHEAR WORKS COMPANY.

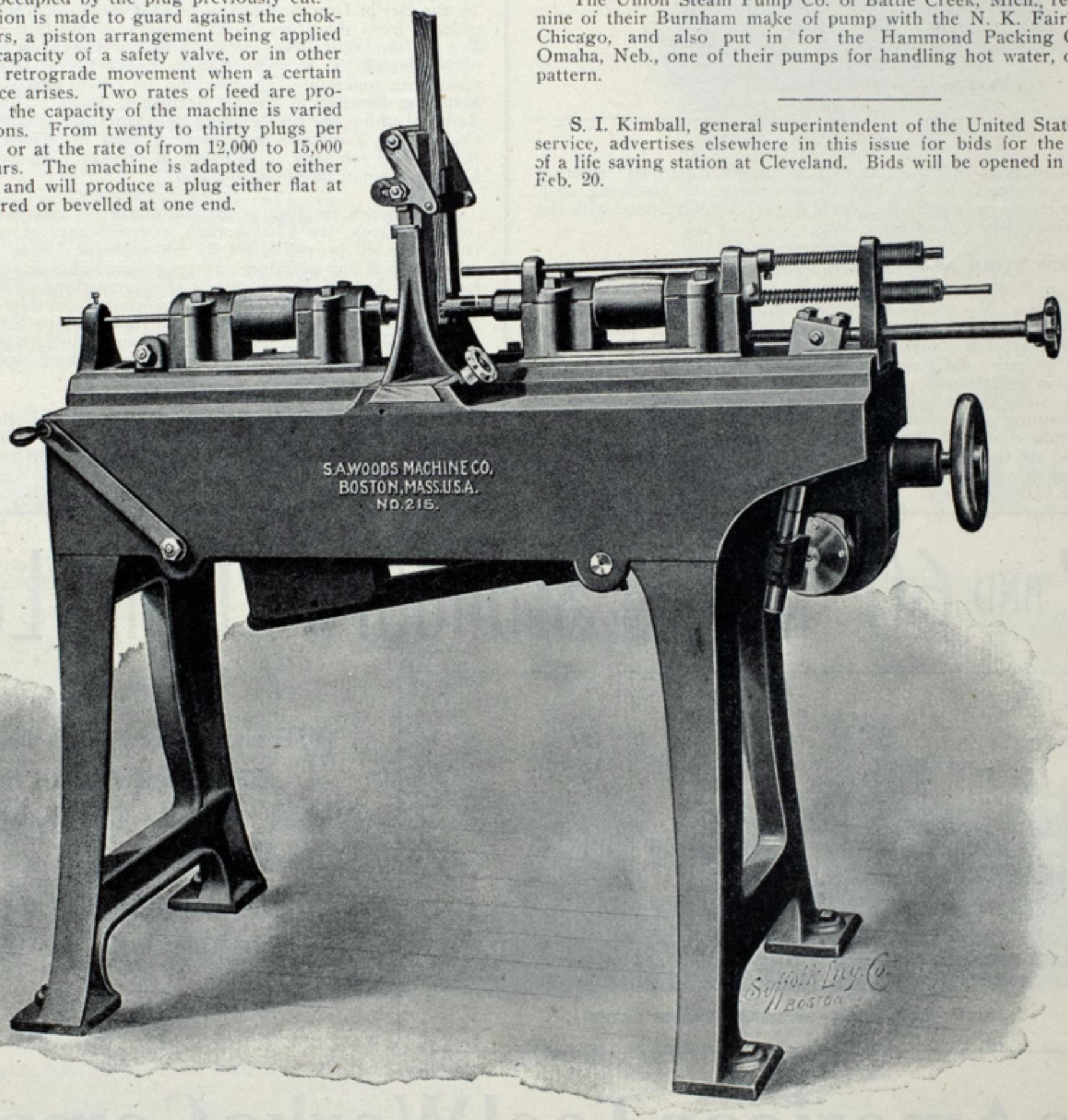
can work all day without any bad results. Owing to the fact that the "Tilden" has no vibration it performs better and cleaner work and when chipping castings it makes a perfectly smooth cut. Another advantage claimed for this hammer, to the exclusion of all others, is that it has a reservoir for oil in the handle and is so arranged that the compressed air feeds the oil automatically to all parts of the tool while in operation, thus saving time, as the tool is always oiled.

AUTO PLUG MACHINE.

In order to meet the large demand for wooden plugs for floor or decking purposes, the machine herewith illustrated has been recently designed and placed on the market, with the result that it has proven in practical use to be fully equal to the requirements. It is entirely of an automatic nature in its operation. All that is necessary in preparing the stock is to strip it up to the thickness and width from which the plugs of the desired dimensions may be cut. A strip of wood is placed in the receiver and from that point on the automatic nature of the machine asserts itself, requiring simply the insertion of one strip of wood after another.

One frame or head stock carries the plug cutter and the other the chafer cutter. Upon the plug being cut, it is held in position until chamfered, when it is automatically released and drops down. At the same time the stock is likewise released and by gravity feed drops down into the position lately occupied by the plug previously cut.

Especial provision is made to guard against the choking up of the cutters, a piston arrangement being applied which acts in the capacity of a safety valve, or in other words, allows of a retrograde movement when a certain amount of resistance arises. Two rates of feed are provided and by these the capacity of the machine is varied to suit the conditions. From twenty to thirty plugs per minute may be cut, or at the rate of from 12,000 to 15,000 per day or ten hours. The machine is adapted to either hard or soft wood and will produce a plug either flat at each end or chamfered or bevelled at one end.



AUTO PLUG MACHINE MADE BY S. A. WOODS MACHINE COMPANY.

For general simplicity, considering its automatic nature, this machine is a wonder. It is in use at several of the United States navy yards, as well as among the largest ship building concerns in this and foreign countries. Full details may be obtained from the designers and builders, the S. A. Woods Machine Co., South Boston, Mass.

At the annual meeting of the American Protective Tariff League held in New York recently resolutions were adopted reflecting on the scarcity of American built vessels carrying the American flag available for use by the United States in an emergency, and the fact that as a nation we are carrying in American vessels not more than one-eighth of the total volume of American commerce, and urging congress to enact legislation that shall remedy these defects.

GROWTH OF SHIP BUILDING IN BALTIMORE.

Baltimore, Md., Feb. 7—The past year was the most prosperous in the history of ship building in Baltimore. There were constructed within the twelve months forty-four vessels of all types, aggregating 18,364 tons and with a total valuation of $1,633,300. In 1898 there were built forty-two vessels of 9,185 tons, valued at $689,385.

The Columbian Iron Works turned out the steamer Hartford, United States revenue cutter Seminole and tugs Piedmont and Savage, the latter for the Consolidation Coal Co.; William E. Woodall & Co., steamer Brockway, and car float for the United States navy; Thomas McCosker & Co., tugs Peerless and Sarah; Charles Rohde, thirteen harbor lighters; R. M. Spedden Co., tug Joseph M. Clark, and United States quartermaster's steamer General Hunt; David Thursby, one harbor lighter; Charles Reeder & Sons, steamer Queen Anne; Maryland Steel Co., steamer Chester W. Chapin, tug Brittania and steamer Pleiades; Nilson Yacht Building Co., yachts Marguerite and Water Nymph; Wm. Skinner & Sons Ship Building & Dry Dock Co., three harbor lighters; Sanford & Brooks, one dredge and two scows; Joseph Thomas & Son, schooner-yacht Lucille and one sloop yacht; E. J. Codd Co., steamer E. Warren Reed, tug J. H. Riehl and two dredging machines. Almost all of these concerns were also engaged on a large amount of repair work.

The Union Steam Pump Co. of Battle Creek, Mich., recently placed nine of their Burnham make of pump with the N. K. Fairbanks Co. of Chicago, and also put in for the Hammond Packing Co. of South Omaha, Neb., one of their pumps for handling hot water, of the Moore pattern.

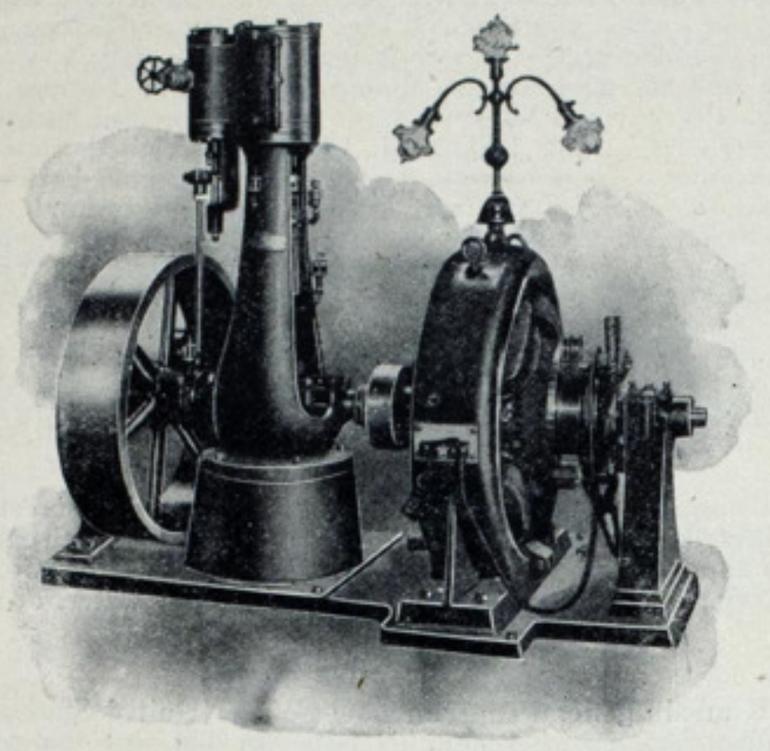
S. I. Kimball, general superintendent of the United States life saving service, advertises elsewhere in this issue for bids for the construction of a life saving station at Cleveland. Bids will be opened in Washington, Feb. 20.

One of the latest publications of the United States hydrographic office is a very neat small map of the great lakes which is an index to all coast-special and harbor charts of the lake system. On the back of the sheet is a full list with prices of charts of the great lakes issued by the hydrographic office, by the United States army engineer corps and by the British admiralty.

In addition to the two vessels building at Stettin, Germany, for the Russian-East Chinese Railway Co., two large passenger steamers have been ordered, one to be built at Kiel and the other at Trieste. The Neptun Ship Building Co. of Rostock, has also received an order from the same company for two vessels of smaller dimensions. All of these vessels are to be delivered within fourteen months.

AUXILIARY ENGINES.

The illustration shows a 7 x 7 upright engine, which is meeting with great favor with manufacturers of generating sets for ship lighting. The combination shown is a 175-light dynamo and 7 x 7 engine on a base 34 x 60 inches and 64 inches high. The Racine Hardware Manufacturing Co., builders of this engine, are supplying them to no less than eight different manufacturers of dynamos, as well as for other purposes where a strong, simple engine is needed, and those desirous of obtaining such engines, either singly or in quantity, would do well to correspond with the Racine Hardware Mfg. Co., Racine, Wis.



NEW YORK AS A SHIP BUILDING CENTER.

In the course of an address at the Lotos Club, in New York city a few evenings since, Mr. Andrew Carnegie said: "Reference has been made to the share which I have in the work of insuring for our country its supremacy in steel, a supremacy which obviously carries with it future supremacy in so many different departments of industry, for steel is the great foundation article upon which so many other articles rest. The cheapest steel means before long the cheapest ships, as it today means the cheapest agricultural implements, bicycles, motor cars, wire, nails and the thousand and one things of which steel is the chief part. It goes without saying that we are to stop exporting steel in crude forms and more and more to export it in manufactured finished articles, from needles to ships. As Green, the historian, says: 'The future home of the English-speaking race is to be found, not on the banks of the Tweed or the Thames, but on those of the Hudson and the Mississippi.' So I predict that the future seat of ship building is to be found, not on the shores of Britain, but upon our Atlantic seaboard."

Apropos of this, it is of interest to note that one large ship building company has decided to increase its capital from $5,000,000 to $10,000,000, one step in the arrangements said to have been perfected at a conference in Philadelphia about a week ago for the construction of an immense plant fronting on the New Jersey side of the Delaware river, at a point between Camden and Gloucester, where the company now owns a large quantity of land.

An equipment of machine tools recently installed by the Marine Engine Co. of Harrison, N. J., will soon be supplemented by a much larger lot of heavy machinery. At present this company is building the Alco Vapor launch. It is intended, however, to enter the heavy marine engine market. The present equipment was installed only with a view of taking care of the small work. Miller F. Moore, who is the president of the company, was well known as a member of the Samuel L. Moore & Sons Co., who rented their Elizabethport, N. J., plant to Lewis Nixon, who is at present operating it under the name of the Crescent Ship Yard. Mr. Moore's intention is to build only the engines for large ships. The building of launches and yachts will, of course, also be continued. The main building of the Harrison plant is 200 by 100 feet, of modern steel frame construction, with 20-foot galleries on each side. The structure was built by the Berlin Iron Bridge Co. of East Berlin, Conn. The engines were ordered from the Harrisburg Foundry & Machine Co. of Harrisburg, Pa., and the boilers were furnished by the Newburgh Steam Boiler Works of Newburgh, N. Y. The Buffalo Forge Co. installed the heating and ventilating apparatus. The machine tools were purchased principally from Manning, Maxwell & Moore, Beaman & Smith of Providence, R. I., the Acme Machine Co. of Cleveland, the American Wood Working Machine Co. of New York and the American Ship Windlass Co. of Providence, R. I. The company is shipping at present a 30-foot vapor launch to Lawrence Jones of Louisville, Ky.

At a recent meeting of the committee on merchant marine, house of representatives, Mr. Chamberlain, commissioner of navigation, spoke in favor of a bill providing for an entry on the log of each vessel, giving particulars of any collision, and providing lights on steam vessels in uniformity with the lights on vessels of other nations. The committee agreed to report both of these bills favorably, and considered, though without final action, a bill to extend the navigation laws to Hawaii. The committee will hold a meeting next Thursday to begin a consideration in executive session of the bill to increase the merchant marine in the foreign trade.

At the annual meeting of stockholders of the Berlin Iron Bridge Co., held at the office of the company in East Berlin, Conn., on Monday, the 29th, the capital stock was increased to $750,000. The following board of directors was elected: Chas. M. Jarvis, Frank L. Wilcox, S. H. Wilcox, H. H. Peck, Geo. H. Sage, D. E. Bradley and Seymour N. Robinson.

ENLARGEMENT OF TOOL WORKS.

Reference was made in these columns recently to the plans of the Chicago Pneumatic Tool Co. for enlargement of their manufacturing plants. It was announced that the Boyer shops in St. Louis will be removed to Detroit, where the capacity will be more than doubled. Now comes the additional information that Mr. J. W. Duntley, president of the Chicago company, has purchased the plant of the Olney Metal Co. in Philadelphia, which is located on a tract of five acres, with railroad side track running into the works. The main building is of steel, about 120 by 300 feet, and with the auxiliary buildings, the Chicago company will be enabled to establish a most complete plant at that place. They will remove their Whitelaw shops from St. Louis to Philadelphia, and will consolidate with them the plant of the National Pneumatic Tool Co., recently purchased, adding additional equipment which will give them considerably more than double the output of the present Whitelaw and National shops.

The factories, as at present located, are running day and night to supply the demand, and these changes must necessarily be consummated at the earliest practicable date. When these changes are carried into effect, the Chicago company will have two of the most complete manufacturing plants in this country.

A report regarding sales of this company in January shows over 100 tools more than in December, 1899. Among orders recently received is one from Japan for an air compressor, and a number of tools for ship building, including riveters, hammers and drills.

Jacob Richtman & Sons of Elsberry, Mo., built one steamer and nineteen barges during the year 1899, but have not at present any contracts on hand.

Treasury Department, U. S. Life-Saving Service, Washington, D. C., January 31, 1900. Sealed proposals will be received at this office until 2:00 o'clock, p. m., of Tuesday, February 20, 1900, and then publicly opened, for the construction of a life-saving station at Cleveland, Ohio. Forms of proposal, plans and specifications, and full information can be obtained upon application to the keeper of the Cleveland Life-Saving Station, Cleveland, Ohio; Superintendent 9th Life-Saving District, Buffalo, N. Y.; Superintendents of Construction, Life-Saving Stations, Atlantic and Lake Coasts, 17 State Street, New York City, or to this office. S. I. Kimball, General Superintendent. Feb. 8

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., January 29, 1900. Sealed proposals for Extension and Repair of Piers at Manistee, Mich., will be received here until 3 p. m., February 28, 1900, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs. Feb. 22.

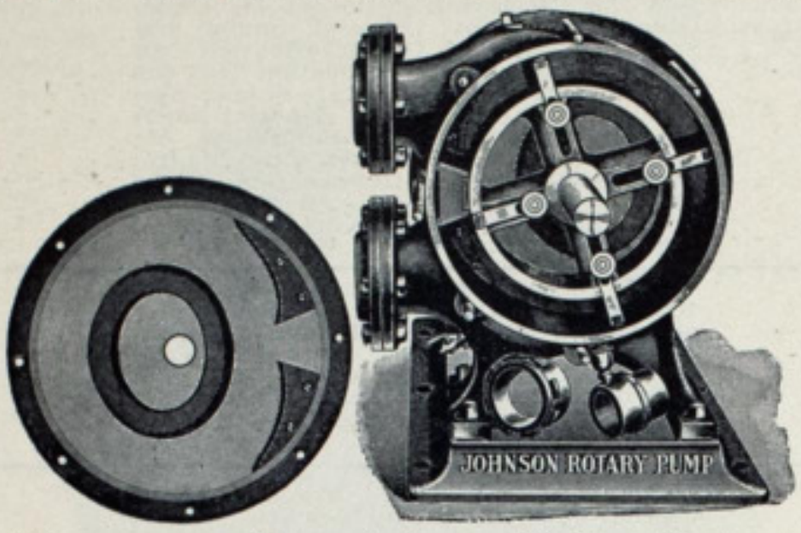
SEALED PROPOSALS will be received at the office of the Light-house until 2 o'clock p. m., March 1, 1900, and then opened for furnishing the materials and labor of all kinds necessary for the construction and delivery of the steam wooden light-vessel, No. 74, delivered at the Buoy Depot, at Little Diamond Island, Portland Harbor, Maine, in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to this office. F. J. Higginson, Rear Admiral, U. S. N., Chairman. Feb. 8.

SEALED PROPOSALS will be received at the office of the Light-house Engineer, Buffalo, N. Y., until 12 o'clock m., March 5, 1900, and then opened, for furnishing the labor and materials necessary for completely constructing and erecting a steel frame keepers' dwelling, and tower with lantern and fog-signal house at entrance to Maumee Bay, Ohio, in accordance with specifications copies of which, with blank proposals and other information, may be had upon application to T. W. Symons, Major, Corps of Engineers, U. S. A. Feb. 8.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., January 24, 1900. Sealed proposals for Extension and Repair of Piers at White Lake, Mich., will be received here until 3 p. m., February 23, 1900, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs. Feb. 15.

JOHNSON ROTARY PUMP.

The Johnson rotary pump, an interior view of which is presented herewith, is manufactured by the Davis Johnson Co. of 41 Randolph street, Chicago. Capt. James Reed of wrecking fame on the great lakes



has two of these pumps and he says they are highly satisfactory. "There are, of course, pumps that will throw more water," the manufacturers say, "but they require a higher rate of speed and greater power. This pump is just right for bilge pump service."

The particular claim for the Johnson pump is large volume with a minimum amount of power in operation. They are made to 6-inch, capacity 750 gallons per minute. Among other claims are simplicity of construction, positive action, easy and quiet operation and all parts interchangeable. It is made as a belt pump, steam pump, or geared to electric motor or gasoline engine. It is made in both iron and bronze and in acid proof alloy.

Mr. W. I. Babcock, under whose management the Chicago Ship Building Co. has attained a high place among the leading works of its kind in America, has been elected president of the company. Other officers are W. L. Brown, vice president, O. R. Sinclair, secretary and treasurer, and J. A. Ubsdell, Jr., assistant manager. The advancement of Mr. Babcock to the presidency of the Chicago company is undoubtedly made with the approval and very probably by direction of Mr. W. L. Brown, who is president of the parent organization in the consolidated lake ship yards, the American Ship Building Co.

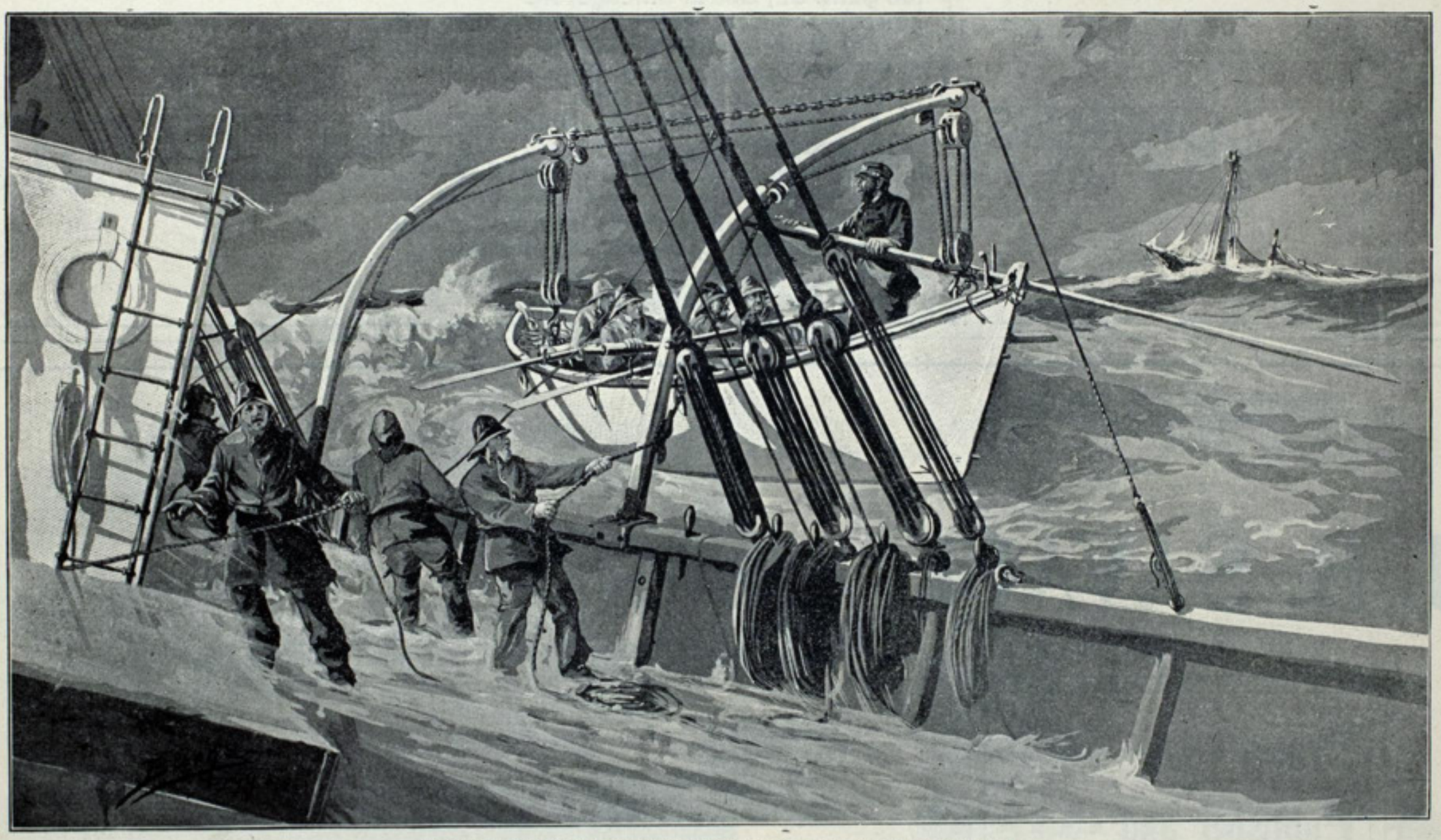
Launching of Ships' Boats.

A DEVICE OF RELIABLY AUTOMATIC AND OF SIMPLE CONSTRUCTION.

The subject of launching ships' boats and the demand for the most improved appliances with which to perform this perilous work was made one of the chief subjects for discussion before the Society of Naval Architects and Marine Engineers at its last annual meeting in New York. The importance of adapting the best appliances, both in the form of davits with which to swing the boats and the gear for detaching them, was made manifest in a paper read before the society by Mr. John Hyslop of New York.

Mr. Hyslop's experience in several disasters, where the loss of life was appalling owing to the lack of improved appliances with which to handle the boats, and his ability to discuss the subject appeals to those having these matters in charge in the construction and management of vessels, and should cause them to consider this part of a vessel's equipment one of the most important features. On the contrary, however, in most instances, the greatest attention is given and money spent for ornamentation and luxurious appointments. The traveling public are ignorant of these matters, and the want of proper appliances to launch the boats in time of disaster is only made apparent when the necessity for their use arises.

There are many devices now in use for the purpose of launching and freeing boats from a ship's side that will satisfactorily perform their work in ordinary times, when the conditions are favorable and when properly operated. Many of them are complicated in construction and become inoperative on account of rust, paint and ice, and they are so placed in the boats as to be difficult of access when it is necessary to oil them and keep them free of ice. There are so many styles in use that sailors require special drilling for each kind of device in order to successfully operate them.



STANDARD AUTOMATIC BOAT DETACHING DEVICE IN OPERATION.

The greatest difficulty has been experienced in obtaining a device that will reliably perform its work in time of disaster, when the conditions are invariably most unfavorable. It would seem that in the construction of all devices the essential feature of hooking on has been overlooked. The records are numberless where boats have been swamped alongside and lives lost through the inability to attach and hoist out quickly, not to mention the fingers that have been jammed and lost in the vain effort to hook the boat on.

The accompanying illustration represents a boat being lowered for the purpose of rescuing the crew of a vessel in distress, equipped with the Standard Automatic Releasing Hooks, a device that has proved itself free from all the objections mentioned above, and possessing the necessary requirements to make a mission of this kind a success. The advantages claimed for this device are: Simplicity of construction; made of a metal which is non-corrosive, requiring no oil or attention to keep it ready for use; reliably automatic, the mode of reeving the falls making it impossible for one end of the boat to detach without the other, irrespective of which end strikes the water first. It is so placed in the boat as to be easy to get at at all times, and can be hooked on in the roughest sea, or darkest night without danger of injury to the hands of those hooking it on. With this device a boat can be lowered and automatically detached while the vessel is under full speed.

The United States Government has recognized the merits of this device to the extent that it has applied it to the boats of vessels in all its maritime branches, and the number of vessels that are equipped with it, both steam and sail, on the coast and lakes, and the daily receipt of orders indicates that its use will become universal.

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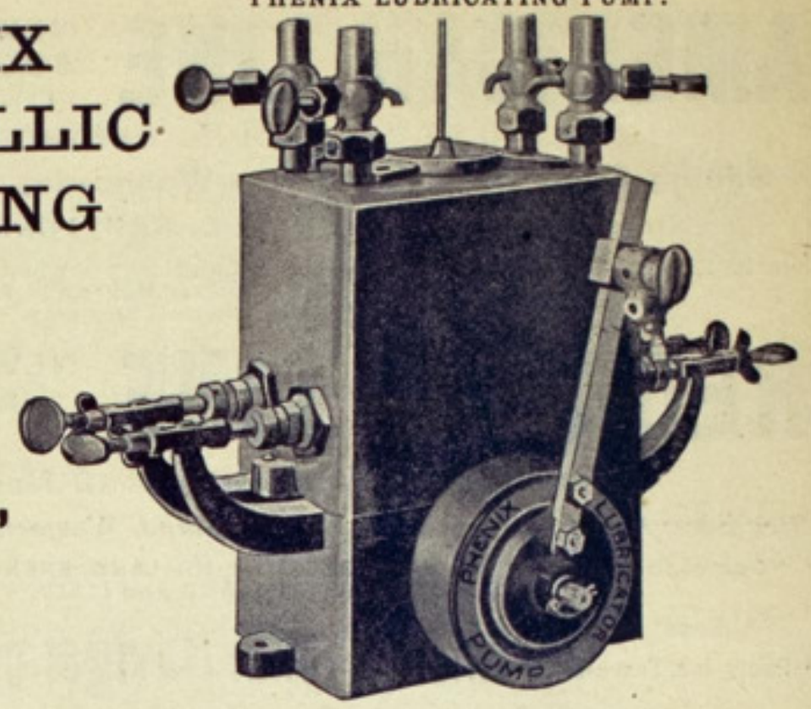

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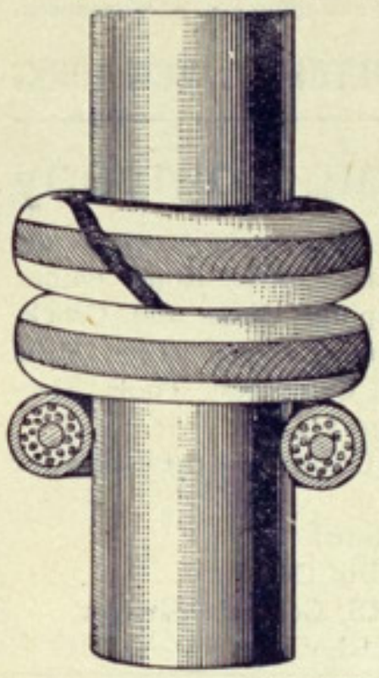

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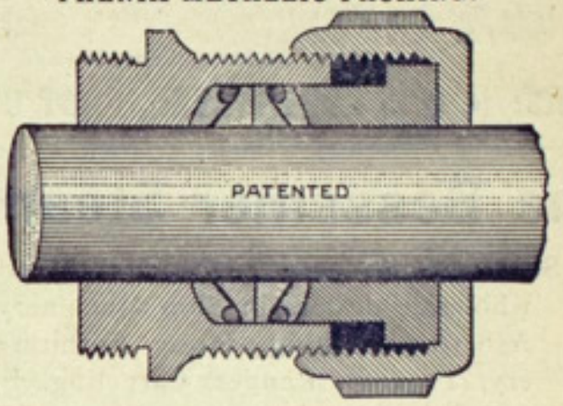

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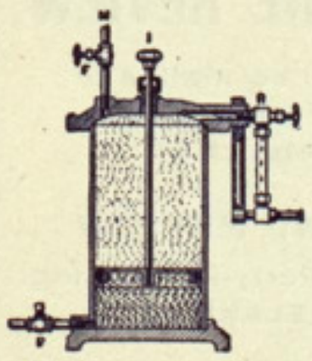

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Detroit Screw Works.....Detroit.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co.....Morris Heights, N. Y.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Kingsford Found'y & Machine Works.Oswego, N. Y.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Roberts Safety Water Tube Boiler Co....New York.
Stirling, The Co.....Chicago.
Trigg, Wm. R. Co.....Richmond, Va.
Union Iron Works.....San Francisco.
Watson, Egbert P.....Elizabeth, N. J.
Wolff & Zwicker Iron Works.....Portland, Ore.

BOILER COMPOUNDS.

Dearborn Drug & Chemical Works.....Chicago.

BOILER COMPOUND FEEDER.

Hall Compound Feeder Co.....Chicago.

BOILER TUBES, SEAMLESS—Brass and Copper.

Hungerford Brass & Copper Co.....New York.
Shelby Steel Tube Co.....Cleveland.

BOILER FURNACES, FIRE FRONTS, ETC.

Continental Iron Works.....New York.

BOILER STAYBOLT IRON.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BOLT CUTTERS.

American Tool Works Co. (The).....Cincinnati.
Manning, Maxwell & Moore.....New York.

BORING AND TURNING MILLS.

American Tool Works Co. (The).....Cincinnati
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

BRASS AND BRONZE CASTINGS, SHEETS, RODS, ETC.

Ajax Metal Co.....Philadelphia.
Cory, Chas. & Son.....New York.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.

BRIDGES, BUILDERS OF.

Berlin Iron Bridge Co.....East Berlin, Conn.
Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Mach. Co..Cleveland.
McMyler Mnfg. Co.....Cleveland.
Webster, Camp & Lane Machine Co.....Akron, O.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

CAPSTANS.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

CHAINS.

Hayden, P., S. H. Co.....Columbus, O.
Lebanon Chain Works.....Lebanon, Pa.

CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.

CHRONOMETERS.

Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.
Also most of the ship chandlers.

CHUCKING MACHINES.

American Tool Works Co. (The).....Cincinnati.
Manning, Maxwell & Moore.....New York.

COAL PRODUCERS AND SHIPPERS.

Castner, Curran & Bullitt.....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Osborne, Saeger & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburgh & Chicago Gas Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co....Buffalo.
Youghiogheny & Lehigh Coal Co.....Chicago.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting & Conveying Mach. Co..Cleve'and.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Webster, Camp & Lane Machine Co.....Akron, O.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COMPASS ADJUSTER.

Simpson. Geo. A.....Sault Ste. Marie, Mich.

CONDENSERS.

See pumps, valves, steam specialties, &c.

COPPER AND SHEET IRON WORK.

Pusey & Jones Co.....Wilmington, Del.

CORDAGE.

American Mnfg. Co.....New York.
See also ship chandlers.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

COTTON SAIL DUCK "ONTARIO."

Turner, J. Spencer Co.....New York.

CRANES.

Brown Hoisting & Conveying Mach. Co..Cleveland.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Webster, Camp & Lane Machine Co.....Akron, O.

CRANK PINS.

Bethlehem Steel Co.....Bethlehem, So. Pa.

DECK PLANING MACHINERY.

Dallett, Thos. H. & Co.....Philadelphia.

DECK SEAMS, COMPOSITION FOR.

Cole & Kuhls.....Brooklyn, N. Y.

DRILLS—ROCK DRILLS, COAL CUTTERS, ETC.

Ingersoll-Sergeant Drill Co.....New York.

DRILLS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.
Q. & C. Co.....Chicago.

DRILL PRESSES—DRILLS OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

DRYING APPARATUS.

Sturtevant Co., B. F.....Boston.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
McWilliams, Frank.....1 Broadway, New York.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Newport News Ship Bldg Co....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.

ELEVATORS.

Morse, Williams & Co.....Philadelphia.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co.....Buffalo.
General Electric Co.....Schenectady, N. Y.
Sturtevant, B. F. Co.....Boston.
Westinghouse Electric & M fg. Co..Pittsburgh, Pa.

ELECTRIC HOISTS AND CRANES.

General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Manning, Maxwell & Moore.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co., and Chas. L. Seabury & Co., Consolidated.....New York.
Giddings & Stevens.....Rockford, Ill.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Eng. Bldg Co..Philadelphia.
Newport News Ship Bldg Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Giddings & Stevens.....Rockford, Ill.
Hillman, Gustav.....Brooklyn.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Oldham, Joseph R.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.
Powell, Ambrose V.....Chicago.
See, Horace.....New York
Wood, W. J.....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.
Bourne-Fuller Co.....Cleveland.
Cleveland City Forge & Iron Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.
Page Bros. & Co.....Boston.

FLAGS AND BUNTING.
See ship chandlers.

FLUSHOMETERS.
Kenney, The Co.....New York.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas)..... Philadelphia.
Graham, James & Co.....Detroit.
Hanna, M. A. & Co.....Cleveland.
Hanlon, Mark H.....Cleveland.
Osborne, Saeger & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Port Royal Dock Co.....Sault Ste. Marie, Mich.
Pittsburgh & Chicago Gas Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co..Buffalo.
Smith, Stanley B. & Co.....Detroit.
Youghiogheny & Lehigh Coal Co.....Chicago.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS ENGINES.
Garden City Motor Co.....Chicago.
Giddings & Stevens.....Rockford, Ill.
McMyler Mnfg. Co.....Cleveland.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Manning, Maxwell & Moore.....New York.
See also valves and steam specialties.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.
Q. & C. Co.....Chicago.

HAMMERS, POWER DROP.
Bement, Miles & Co.....Philadelphia.
Chase Machine Co.....Cleveland.

HEATING APPARATUS.
Sturtevant Co., B. F.....Boston.

HOISTING ENGINES.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
Marine Iron Co.....Bay City.
Williamson Bros.....Philadelphia.

HYDRAULIC RIVETERS, SHEARS, PRESSES, ETC.
Bement, Miles & Co.....Philadelphia.
Wood, R. D. & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Ashcroft Mnfg. Co.....New York.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.
Jenkins Bros.....New York.
Hayden & Derby Mnfg. Co.....New York.
Penberthy Injector Co.....Detroit.

INSURANCE, MARINE.
Bartow, J. H.....Cleveland.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Hawgood & Moore.....Cleveland.
Hutchinson & Co.....Cleveland.
Jones, C. R. & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
McDougall, Alex & Co.....Duluth.
Mitchell & Co.....Cleveland.
Myers, James A.....Chicago.
Pauly, H. J.....Milwaukee.
Parker & Millen.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

LATHES OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelph'a.
Manning, Maxwell & Moore.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIFE BOATS—METALLIC.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.

LIGHTS, SELF-CONTAINED, FOR DOCKS, DREDGES, ETC.
Wells Light Mfg. Co.....New York.

LUBRICATING PUMPS.
Phenix Metallic Packing Co.....Chicago.

MACHINE TOOLS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Ajax Metal Co.....Philadelphia.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelph'a.
Manning, Maxwell & Moore.....New York.

NAPHTHA LAUNCHES.
Gas Engine & Power Co.....New York.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.
Also most of the ship chandlers.

NAUTICAL SCHOOL.
Chicago Nautical School.....Chicago.

NAVAL ARCHITECTS.
Curr, Robert.....Cleveland.
Hillman, Gustav.....Brooklyn.
Kirby, Frank E.....Detroit.
Oldham, Joseph R.....Cleveland.
See, Horace.....New York.
Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.
Bethlehem Steel Co.....So. Bethlehem, Pa.

OAK, TIMBER AND PLANK.
Martin-Barriss Co.....Cleveland.

OILS AND LUBRICANTS.
Dixon Crucible Co., Jos.....Jersey City, N. J.
Lake Carriers' Oil Co.....Cleveland.
Standard Oil Co.....Cleveland.

PACKING.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

PLUMBING, MARINE.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.
Chicago Pneumatic Tool Co.....Chicago.
Manning, Maxwell & Moore.....New York.
Q. & C. Co.....Chicago.

POCAHONTAS COAL.
Castner, Curran & Bullitt.....Philadelphia.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co.....Weymouth, Mass
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

PROJECTORS, ELECTRIC.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

PUMPS, STEAM.
Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Kingsford Foundry & Machine Works..... Oswego, N. Y.
Van Duzen, The E. W. Co.....Cincinnati.
Worthington, Henry R.....New York.

PUMPS, ELECTRIC.
General Electric Co.....Schenectady, N. Y.

PUNCHES AND SHEARS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Long & Allstatter Co.....Cincinnati.
Manning, Maxwell & Moore.....New York.
New Doty Mnfg. Co.....Janesville, Wis.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Chicago.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.

ROPE.
American Mnfg. Co.....New York.
See also ship chandlers.

RUBBER INSULATED WIRES.
Roebling's Sons, John A..New York and Cleveland.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Consolidated Safety Valve Co.....New York.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Turner, J. Spencer Co.....New York.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SCREW MACHINES.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

SEARCH LIGHTS.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

SHAPERS.
American Tool Works Co. (The).....Cincinnati.
Manning, Maxwell & Moore.....New York.

SHIP AND BOILER PLATES AND SHAPES—Steel.
Bourne-Fuller Co.....Cleveland.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

STAYBOLT IRON, HOLLOW AND SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STOKERS FOR MARINE SERVICE.
American Stoker Co.....New York.

STRUCTURES OF STEEL, BUILDERS OF.
Berlin Iron Bridge Co.....East Berlin, Conn.

SURVEYORS, MARINE.
Curr, Robert.....Cleveland.
Oldham, Joseph R.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

SEPARATORS, (CENTRIFUGAL).
Keystone Engine & Machine Works..Philadelphia.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
McWilliams, Frank.....1 Broadway, New York.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Roach's Ship Yard.....Chester, Pa.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

"SMOOTH ON" COMPOUND FOR REPAIRS.
Smooth On Mfg. Co.....Jersey City, N. J.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.
Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING ENGINES.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.
Williamson Bros.....Philadelphia.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

THRUST COLLARS FOR PROPELLER SHAFTS.
Ball Bearing Co.....Boston, Mass.

TIMBER—LARGE PIECES.
Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Chicago Pneumatic Tool Co.....Chicago.
Long & Allstatter, The Co.....Hamilton, O.
Manning, Maxwell & Moore.....New York.
New Doty Mnfg. Co.....Janesville, Wis.
Q. & C. Co.....Chicago.

TRUCKS.
Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.

TOWING COMPANIES.
Calvin Co., Ltd.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING, COPPER AND BRASS.
Hungerford Brass & Copper Co., U. T...New York.
Merchant & Co., Inc.....Philadelphia.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.
Manning, Maxwell & Moore.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.
Smith, Edward & Co.....New York.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Bartow, J. H.....Cleveland.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Jones, C. R. & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Miller, Bull & Knowlton.....New York.
McDougall, Alex & Co.....Duluth.
Mitchell & Co.....Cleveland.
Myers, James A.....Chicago.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.
Buffalo Forge Co.....Buffalo.
McCreery, Joseph & Son.....Toledo, O.
Sturtevant Co., B. F.....Boston.

WIRE ROPE.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WORM GEARING.
Morse, Williams & Co.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Calvin Co., Ltd.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Salvage Association of No. America.....Chicago.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Turner, J. Spencer Co.....New York.
Wilson & Silsby.....Boston.
See also ship chandlers.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.

YAWLS.
Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

CITY TICKET OFFICE, 237 SUPERIOR STREET.

		Arrive from West.	Depart East.
	Eastward:—		
No. 18,	Southwestern Limited.....	.....	*1 55 am
No. 22,	Lake Shore Limited.....	*2 15 am	*2 20 am
No. 28,	New York & Boston Exp..	*7 40 am	*8 00 am
No. 32,	Fast Mail	*11 20 am	*11 25 am
No. 44,	Accom. via Sandusky.....	†1 15 pm	.....
No. 46,	Southwestern Express	.....	*3 00 pm
No. 6,	Limited Fast Mail.....	*5 40 pm	*5 45 pm
No. 10,	C., N. Y. & Boston Special	*7 35 pm	*7 40 pm
No. 2	Day Express	†9 10 pm	†9 35 pm
No. 126,	Norwalk Accommodation..	†7 55 am	.....
No. 40,	Tol. & Buff. Ac., v. Norw'k	†10 00 am	†10 30 am
No. 116,	Conneaut Accommodation.	.....	†4 30 pm
		Arrive from East.	Depart West.
	Westward:—		
No. 11,	Southwestern Limited.....	*3 20 am	.....
No. 15,	N. Y., Bos. & Chi. Spl.....	*3 55 am	*4 05 am
No. 7,	Day Express	.....	†6 30 am
No. 19,	The Lake Shore Ltd.....	*7 45 am	*7 50 am
No. 23,	Western Express	*11 10 am	*11 15 am
No. 33,	Southwestern Express.....	*11 25 pm	.....
No. 31,	United States Express.....	.....	*12 10 pm
No. 47,	Accommodation	.....	†3 00 pm
No. 141,	Sandusky Accommodation.	.....	†3 10 pm
No. 127,	Norwalk Accommodation..	.....	†5 10 pm
No. 37,	Pacific Express	*6 35 pm	*7 00 pm
No. 3,	Fast Mail Limited.....	*10 50 pm	*10 55 pm

*Daily, †Daily except Sunday. ‡Daily except Monday.
Trains Nos. 28 and 37 run via Erie station.

VESSELS FOR SALE, FOR CHARTER, Etc.

Space under this heading 25 cents a line, each insertion, for three insertions or less. Special rates for periods of more than three insertions.

—FOR SALE—100,000 feet of dry No. 1 white pine vessel decking, cut 3½x5½, eighteen feet and longer. Address F. P. Cole, Bay City, Mich. Feb. 15.

—FOR SALE—Two Scotch boilers, 10½x11 feet shell, allowed 100 pounds pressure. J. J. Rardon, 21 Sherman street, Chicago. Feb. 1.

—FOR SALE—Steamer C. W. Moore, 125x25x9 feet. As a barge she will carry 265M lumber. Rebuilt with steel arches in 1892. H. W. Hart, Green Bay, Wis. tf

—FOR SALE—Schooner Helvetia. Carries a million feet of lumber or 1,600 tons iron ore. H. J. Johnson, 504 Society for Savings Bldg., Cleveland. tf

—FOR SALE—Complete dredging outfit, consisting of two dredges, tug and dump scows. For particulars address Wickes Bros., Saginaw, Mich. Feb. 22

—FOR SALE CHEAP—Fore-and-aft compound marine engine, cylinders 16 and 32 inches diameter by 25 inches stroke. Now in course of construction. Bell's Steam Engine Works, Buffalo, N. Y. Feb. 8.

—FOR SALE—Steam derrick, clam, lighters and second-hand sand pumps; all at Chicago. Also for sale or rent, dock and warehouse or wharfage sites. Wallace Bros., Detroit, Mich. Feb. 8.

—FOR SALE—Steam barge and consort. Steamer classes A 1 and is of 900 tons ore or 600,000 feet lumber capacity on 13 feet draught. Tow barge rates A 2 and carries 650,000 to 750,000 feet of lumber on about same draught. John C. Spry, 707 Chamber of Commerce, Chicago. tf

—FOR SALE—Boiler, engine and machinery of steamer Aurora. Will sell cheap. John Stevenson, Detroit. tf

—FOR SALE—Machinery from wrecked steamers St. Lawrence and H. A. Tuttle, consisting of engines, boilers, steam steering engines, steam windlasses, etc. For particulars inquire of E. G. Crosby & Co., Muskegon, Mich. tf

MARINE REVIEW

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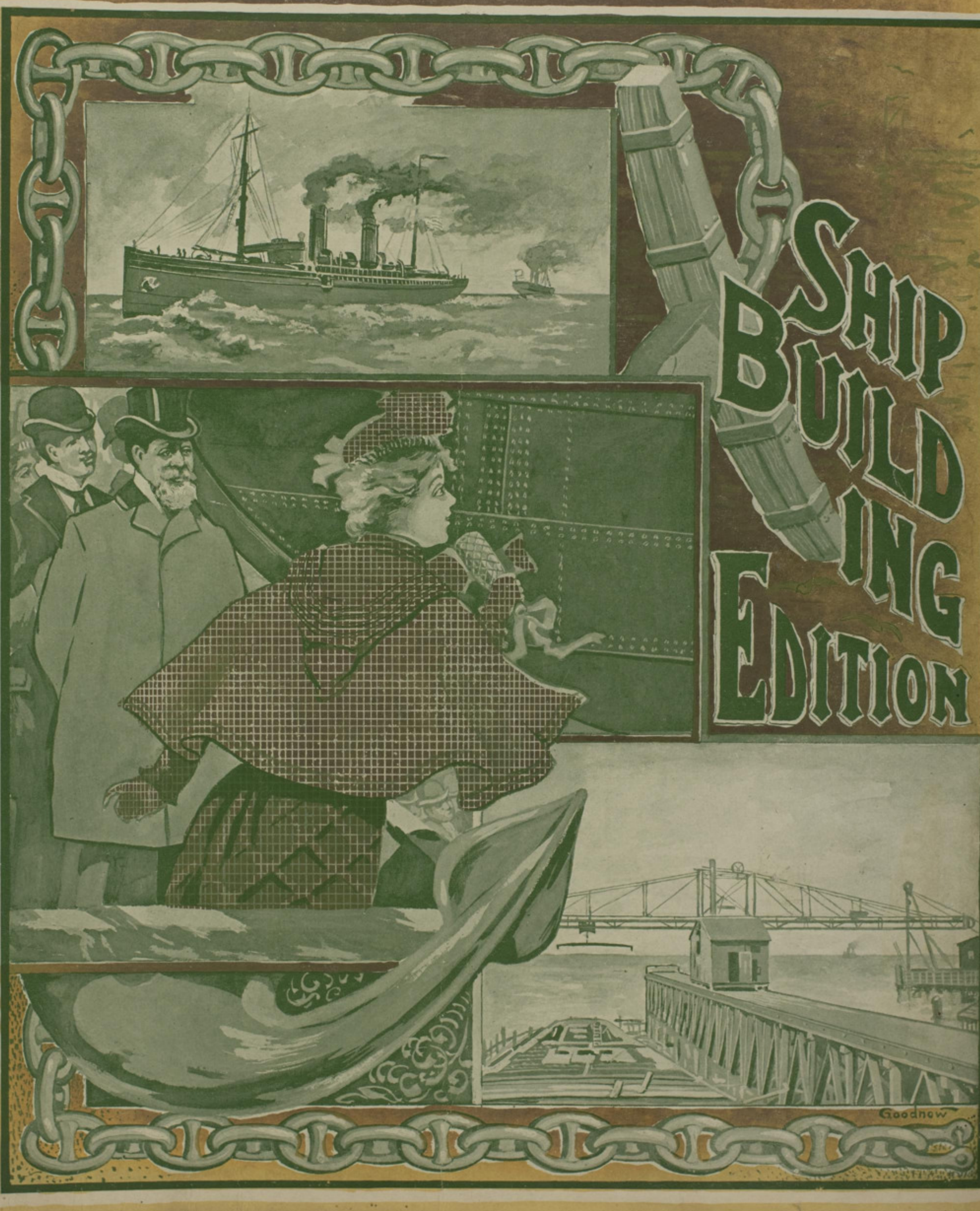
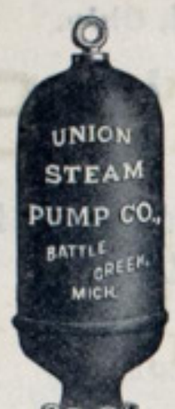


THE UNION STEAM PUMP CO.



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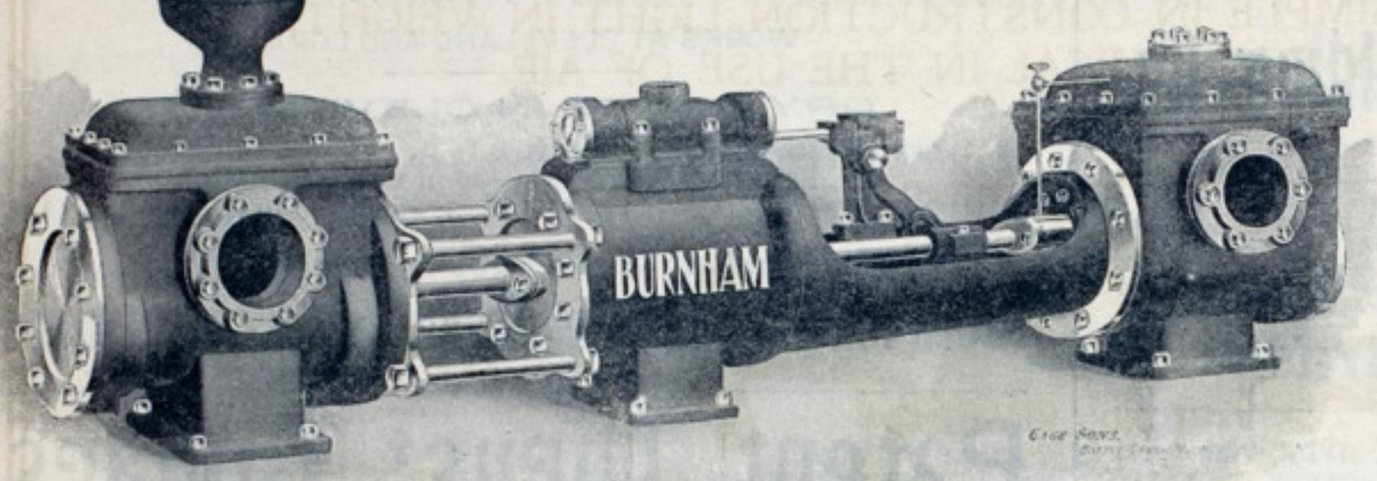
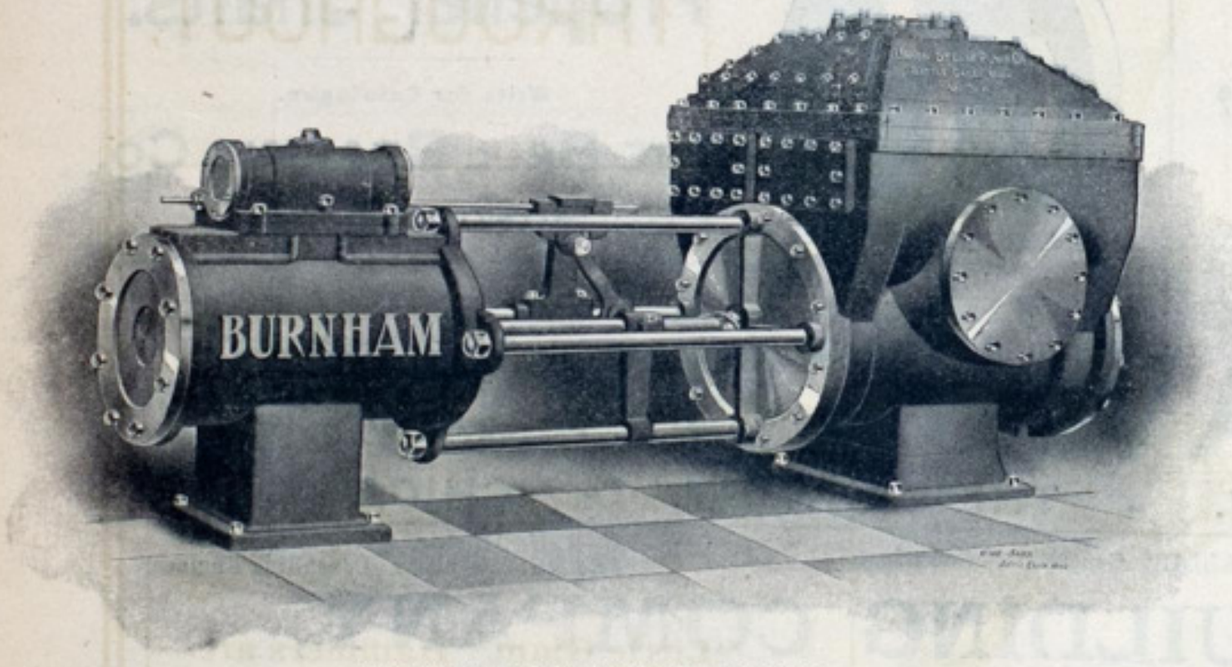
MANUFACTURERS OF THE

Moore and Burnham Steam Pumps For Every Duty.

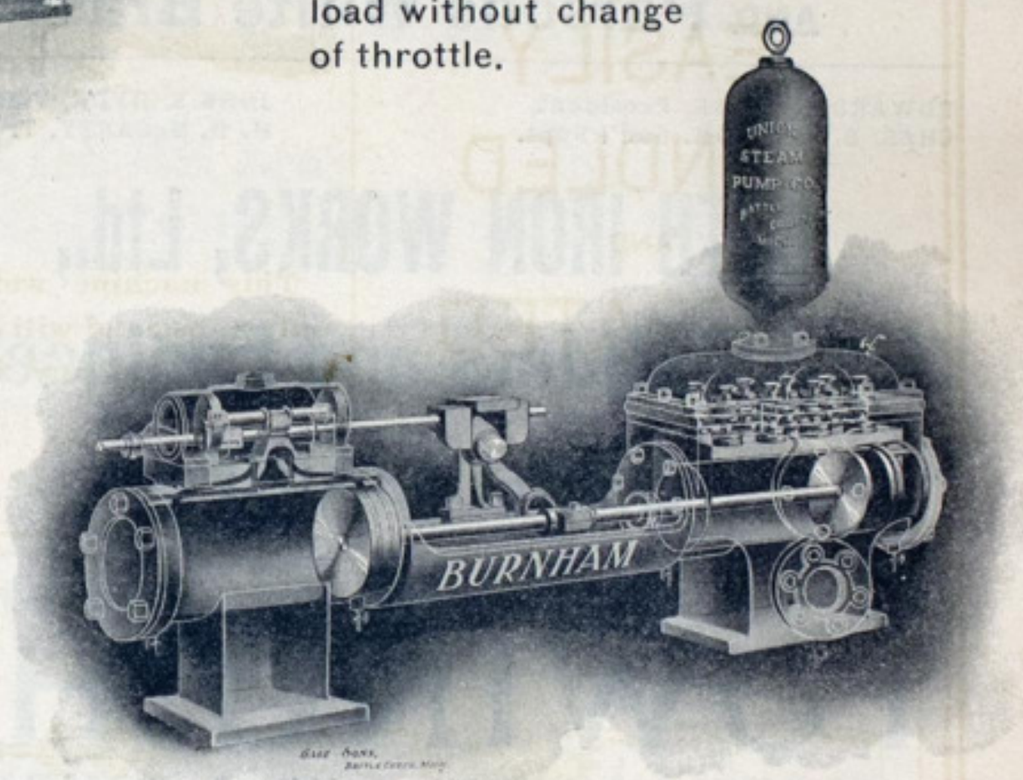
We offer the ONLY steam pump having a FLAT-FACED valve, with a minimum of clearance in the steam cylinder WHICH WILL NOT strike the HEADS under a full head of steam when the pump is in labor and the suction may become broken, and will not injure from load to no load without change of throttle.



BURNHAM COMBINED AIR AND CIRCULATING PUMP.



BURNHAM VACUUM PUMP.



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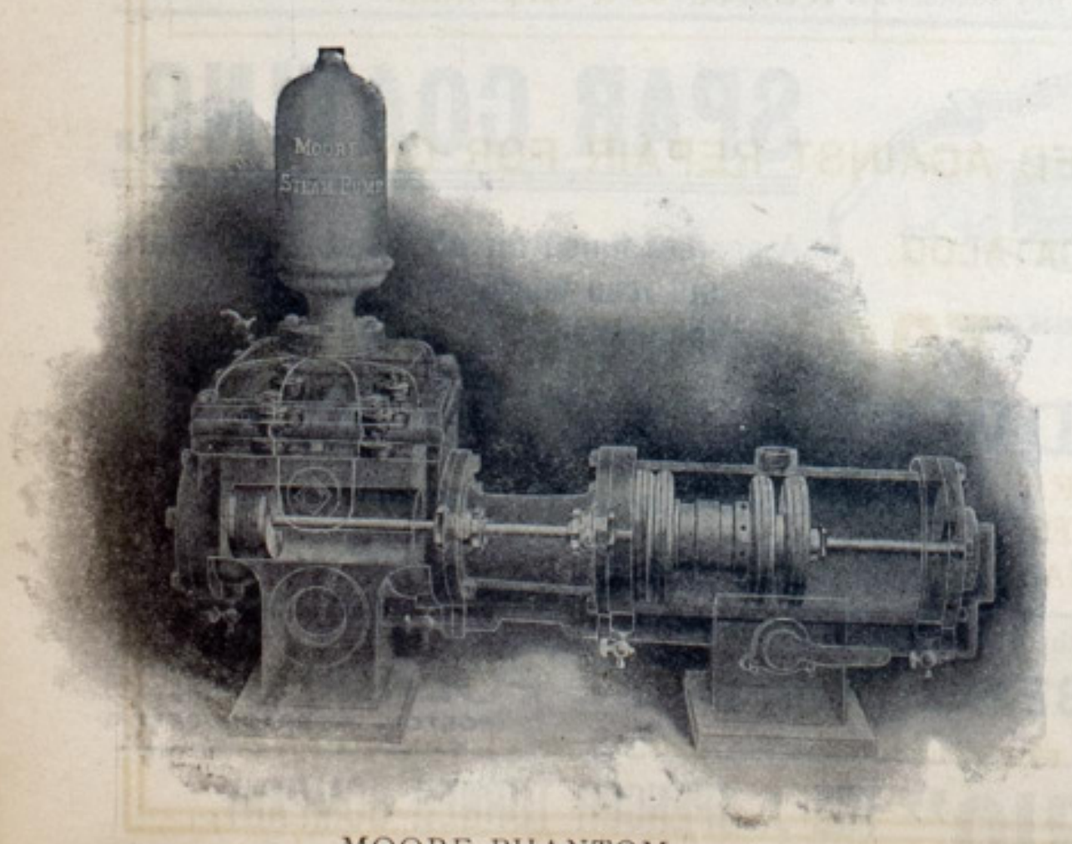
Write for Catalogue and Prices.



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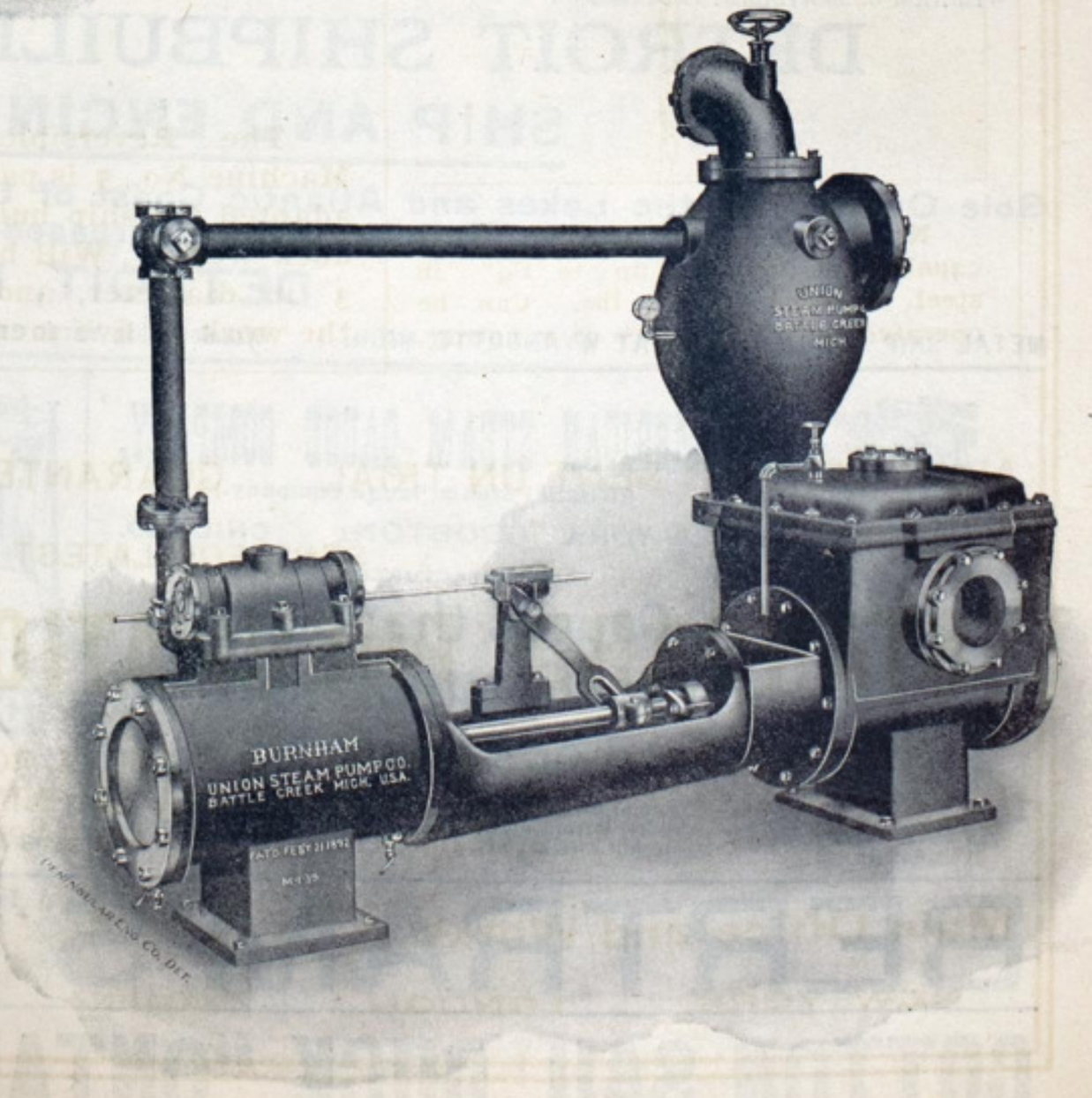
The Simplest Pump on Earth. Has no Equal as a Boiler Feeder.



BURNHAM INDEPENDENT AIR PUMP AND JET CONDENSER.